Adoption of Information and Communication Technology in Small and Medium Enterprises: A Synthesis of Literature

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Abstract

Small and Medium Enterprises (SMEs) are an important component of the economy of a country. Information and Communication Technology (ICT) offers tremendous opportunities for the growth and development of SMEs. A number of researchers have tried to explore and investigate issues related to the adoption of ICT. This paper reviews the studies that emphasize the need to adopt ICT in SMEs, benefits of ICT in SMEs, identifies problems in adoption and offers suggestions for overcoming barriers to adoption. An attempt has been made to link various recent researches to present an integrated picture and identify the gaps in the existing research. The study also provides a direction for future researches.

Key Words: e-business, Information and Communication Technology (ICT), Small and Medium Enterprises (SMEs).

1. Introduction

Small businesses make substantial contributions to national economies and are estimated to account for 80% of global economic growth (Jutla et al., 2002). Small and Medium Enterprises (SMEs) are seen as a critical component in the economic growth of developing countries because they are a major source of income, promote entrepreneurship, and provide employment. For this reason, considerable attention is paid to positioning SMEs to capture emerging business opportunities that have been created by the emergence of knowledge-based societies. Many of them are already demonstrating their potentials and capabilities by grasping the opportunities offered by Information and Communication Technology (ICT). Luetkenhorst (2004) found that on average, they represent over 90% of enterprises and account for 50-60% of employment at the national level. He further argues that SMEs are particularly important in supporting economic
growth and livelihoods in developing countries because they (inter alia):

- tend to use more labour-intensive production processes than large enterprises, boosting employment and leading to more equitable income distribution;
- provide livelihood opportunities through simple, value-adding processing activities in agriculture-based economies;
- promote entrepreneurship; and
- create linkages between small and large enterprises, and hence support the building up of systemic productive capacities and the creation of resilient economic systems.

Despite their potential to contribute to economic growth, Medium and Small Enterprises (SMEs) are unable to compete well due to exogenous and endogenous constraints (Harvie and Lee, 2002; Kirby and Watson, 2003; Brown, Earle and Lup, 2005; Fogel, Hawk, Morck and Yeung, 2006). Institutional analysis has been used in a variety of ways to diagnose and offer remedies for functional, performance and competitiveness issues associated with SMEs (Basu 1998; Busenitz, Gomez and Spencer, 2000; Carlsson, 2002; Carney and Gedajlovic, 2002). This paper draws upon the recent literature to identify the needs and benefits of ICT adoption in SMEs, factors influencing ICT adoption, barriers faced and finally the solution offered. An attempt has been made to identify the lesser explored areas, which can have a substantial impact upon the adoption of ICT by SMEs.

2. Meaning of SMEs

SME's are usually defined as enterprises that employ no more than 250 employees. The definitions of "small" and "medium" sized enterprises differ from one country to another. SMEs have been defined against various criteria such as the number of workers employed, the volume of output or sales, the value of assets employed, and the use of energy. The EU defines a micro-organization as employing up to nine workers, the small enterprise having between 10 and 99 employees and the medium-sized enterprise having 100-499 employees. The US defines small businesses as having up to 500 employees. In the Asia-Pacific region, SMEs are defined based on employment, assets or a combination of the two. The most common range in many countries is from 50-200 employees. Other definitions are based on whether the owner of the enterprise works alongside the workers, the degree of sophistication in management, and whether or not an enterprise lies in the "formal" sector. For example, the Organisation for Economic Cooperation and Development (OECD) defines establishments with up to 19 employees as "very small"; with up to 99 as "small"; from 100 to 499 as "medium"; and with over 500 as "large".

The most widely accepted definition is still one based on the ideas of the Bolton committee (1971). The committee identified the following three important factors of an SME:

- they have a relatively small share of their marketplace;
- they are managed by owners or part owners in a personalized way, and not through the medium of a formalized management structure;
- they are independent, in the sense of not forming part of a larger enterprise.
In India the Micro, Small and Medium Enterprises Development Act, 2006, defines SMEs on the basis of investments in plant and machinery. For enterprises engaged in the manufacture of goods:

- **Micro** - Investment in plant and machinery is less than Rs 2.5 mn
- **Small** - Investment in plant and machinery is over Rs 2.5 mn but not exceeding Rs 50 mn
- **Medium** - Investment in plant and machinery is in excess of the SSI limit but less than Rs 100 mn

For enterprises engaged in providing or rendering services:

- **Micro** - Investment in equipment does not exceed Rs 1 mn
- **Small** - Investment in equipment is over Rs 1 mn but not exceeding Rs 20 mn
- **Medium** - Investment in equipment is in excess of the SSI limit but less than Rs 50 mn

Thus, there seems to be no universal definition of SMEs but most of the definitions seem to be based upon the number of workers employed. Table 1 captures the definitions of SMEs in selected countries.

### Table 1: Definition of SMEs According to Number of Workers Employed

<table>
<thead>
<tr>
<th>Defining country/body</th>
<th>Micro Enterprise</th>
<th>Small Enterprise</th>
<th>Medium</th>
<th>SME</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>Up to 9</td>
<td>10-99</td>
<td>100-499</td>
<td>-</td>
</tr>
<tr>
<td>US</td>
<td>-</td>
<td>500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Thailand</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Less than 50</td>
</tr>
<tr>
<td>S. Korea</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Less than 300</td>
</tr>
<tr>
<td>OECD</td>
<td>Upto 19 (very small)</td>
<td>Upto99</td>
<td>100-499</td>
<td>-</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>-</td>
<td>Less than 50 workers</td>
<td>51-200 workers</td>
<td>-</td>
</tr>
<tr>
<td>Lebanon</td>
<td>-</td>
<td>5-8 workers</td>
<td>10-30 workers</td>
<td>-</td>
</tr>
<tr>
<td>Pakistan</td>
<td>-</td>
<td>1-9 workers</td>
<td>10-300 workers</td>
<td>-</td>
</tr>
<tr>
<td>Syria</td>
<td>-</td>
<td>1-40 worker</td>
<td>40-200 workers</td>
<td>-</td>
</tr>
</tbody>
</table>

### 3. Need for Integrating ICT and SMES

SMEs inherently are small in size and in investment, due to which it is essential for them to be able to deliver quality products and services at reduced cost. Businesses can reduce operational costs by decreasing material, procurement and transaction costs, resulting in lower prices for intermediate and finished goods, and they can also use more and better information to improve the value of their output, in order to gain competitive advantage. The researches on ICT assimilation in SMEs have mainly focused on the need to do so in the changing global business environment. The emergence of the Internet and developments in ICT have opened new markets and considerably altered existing ones (Brynjolfsson & Kahin, 2002). The
emergence and ongoing development of new forms of communication have benefited traditional markets by bringing efficiencies in cost of goods and services (Chaston, 2001; Matlay & Addis, 2002). ICT can also facilitate global connectivity, resulting in new ways of creating and delivering products and services on a global scale. New business models and market configurations enabled by ICT, including business process outsourcing and value chain integration, provide SMEs with access to new markets and new sources of competitive advantage, to drive income growth. The efficiency and effectiveness of the delivery system can be achieved through the utilization of Information and Communications Technology (ICT), which integrates SMEs into the global supply chain. Developing countries have the potential to achieve rapid and sustainable economic and social development by building an economy based upon an ICT enabled and networked SME sector, capable of applying affordable yet effective ICT solutions (UNDP, 2004). Duncombe & Heeks (2001) have discussed the opportunities that ICT provides for SMEs in developing countries.

Due to the opportunities offered by ICT, virtual companies and electronic markets were proposed as new models of organization and transactions, where ICT is considered as the driver of a firm’s competitiveness (Kelly, 1998; Malone & Laubacher, 1998; Davidow & Malone, 1992; Malone et al., 1987; Malone et al., 1989; and Hagel & Singer, 1999).

### Large firms vs. Small firms

Most researches in this area seem to have focused upon big enterprises. This view is supported by Scott Morton (1991) and Drew (2002), who believe that researches have mainly addressed the impact of ICT on the evolution of big corporations. Many studies have derived their critical factors from macro perspectives at country level and have not considered the important factors at micro level for SMEs in an integrated way.

There are many differences in every aspect in the adoption of ICT by small and big firms. The purpose and extent of ICT adoption may differ in both type of firms, as both have different characteristics. Storey (1997) identifies three key areas where small firms differ from the large firm: (1) Uncertainty: the small firm tends to have a limited customer base and product line and there is a greater diversity of owner-objectives. The motivation of the owner is a key influence on small firm performance; (2) Innovation: Small firms tend to be more likely to introduce essentially new innovations and are less committed to existing practices and products; (3) Evolution: small firms are more likely to evolve and change than the large firm, which may be due to the existence of a more flexible culture within the firm.

According to Deschoolmeester, Vanpoucke & Willaert (2004), larger companies are less sensitive for investing in e-business than SMEs, because larger companies are mainly driven by cost cutting to implement e-business and see more opportunities in translating their e-business strategy into a formal long-term plan. Yet, large firms have exploited the opportunities offered by ICT and redesigned their organizational models around technologies. Those firms have been able to achieve efficiency through applications aimed at increasing process integration and automation (i.e. enterprise resource planning), which are important goals for large companies (Venkatraman, 1994; Bradley et al., 1993).
Technology has improved internal co-ordination among scattered employees and teams through electronic infrastructures for communication, document sharing and co-operative work (workflow management) (Sproull & Kiesler, 1991; Fulk & Steinfeld, 1990). Business-to-business (B2B) technologies have been predominantly exploited by larger firms downstream in the supply chain rather than by upstream SMEs (Hawkins & Prencipe, 2000). Thus, big corporations have taken advantage of network technologies to support their communication and manufacturing processes, and also to increase the value of their internal knowledge and competencies (Davenport & Prusak, 1998; Scott Morton, 1991).

From the 1990s, new solutions built around the Internet network have been tailored specifically to small businesses. In particular, researchers and analysts have emphasized the opportunities for firms to manage transactions directly through electronic commerce, by enhancing the reach and richness of the firm’s connections with the market (Kalakota et al., 1999; Bakos & Brynjolfsson, 2000; Evans & Wurster 2000). Traditionally, research on ICT has studied implications for firms through an evaluation of technological solutions available in the market, in order to explain how such applications could satisfy the firms’ needs based on the perspective of technology suppliers (Goldman Sachs, 2000).

Zheng et al. (2004) believe that it is possible to obtain a complete understanding of the real present and future impact of ICT on firm processes only through a buyer-side analysis, by exploring how SMEs refer to technological solutions to support or transform their business strategies.

Though the benefits of embracing technology as competitive advantage and the opportunities resulting from globalization were identified by Levitt (1983), and despite e-business technology facilitating improved business practice (Whitely, 2000), a number of small firms have not capitalized on this approach (Smyth and Ibbotson, 2001). Big businesses identified the need for integrating ICT with their processes and successfully did so. Small businesses also need to understand the benefits of integrating ICT, from their perspective. Cooper & Burgess (2000) identify that there has been limited academic investigation into the evolutionary process followed by SMEs into their use of ICT.

Thus, researchers and practitioners (SMEs) both seem to have a kind of disinterest in understanding the need for integrating ICT in SMEs.

4. Benefits of ICT for SMEs

Researchers have tried to identify the benefits of ICT for SMEs. Small businesses can leverage inherent strengths to incorporate ICT enabled practices. The size of small businesses enables them to be more adaptable and responsive to changing conditions than larger organizations and to further benefit from the speed and flexibility that the electronic environment offers (Arbore & Ordanini, 2006).

Wattanaputtipaisan (2002-03) identifies the opportunities as inter-firm linkages for enhanced collective efficiency, technological and innovation capabilities, and hence competitiveness,
subcontracting and outsourcing relationships, which cover processing and manufacturing activities and services of high value-addition.

Appropriate ICT can benefit SMEs in cost cutting by improving their internal processes, improving their product through faster communication with their customers, and better promoting and distributing their products through online presence. (Small and Medium Enterprises and ICT/SME Adoption, n.d.). In fact, ICT has the potential to improve the core business of SMEs at every step of the business process.

With the use of ICT, networking with other firms, which was previously not possible due to high co-ordination costs or high transaction risks, may become feasible. SMEs attach, next to cost-savings, high importance to cooperation between their suppliers and clients.

Evans and Wurster, (1997) believe that ICT provides the ability to reduce transaction costs, the development of a more level playing field with larger firms, being able to extend marketing efforts, improve communications, identify and develop new markets, cost reduction and developing relationships with suppliers. Improved procurement procedures and staff recruitment are also identified as benefits (Taylor, 2001).

Fillis & Wagner (2005) have categorized perceived benefits as direct short-term, (communication cost savings) indirect short term, (possible business and marketing opportunities), long-term direct benefits, (customer retention and the development of business relationships) and long-term indirect benefit (development of new business initiatives). Tse & Soufani (2003) identify the benefits resulting from virtualization, or the electronic transaction process as communication with a large number of customers, in a variety of geographical settings, and distribution of product information to them and information can be accessed to the same degree as in the large firm.

The potential benefits of e-business have also been recognized as improved communication, establishing competitive advantage, marketing and sales promotion, and improved information search (Ellsworth & Ellsworth, 1995; Poon & Swatman, 1999; Sterne, 1995). Enhanced internationalization of business and being able to function 24 hours per day are further benefits, as the owner-managers of these face-to-face and online software-training organizations demonstrate (Hamill & Gregory, 1997; Quelch & Klein, 1996).

Thus, researches indicate that ICT can enable SMEs to improve the quality of services, operations, efficiencies, employee management and customer satisfaction. Table 2 summarizes the benefits of ICT adoption in SMEs. The benefits explored are from the perspective of various operational efficiencies and customers. Not much has been explored from the perspective of employees. This gap needs to be filled.
5. Factors Determining ICT Adoption in SMEs

Despite the proven need for adoption of ICT and various benefits highlighted by various studies, the adoption may not be very easy. Commitment to e-business adoption is influenced by many factors. Level of adoption of IT among SMEs was not found to be of the same level as advancement in IT (Marshall & McKay, 2000). This low level of adoption particularly impedes SMEs in developing countries. Since the 1980s, researchers, for example, Davis (1989), have attempted to investigate factors that influence the adoption of IT.

Adoption has been viewed as an outcome of a complex process of evaluation of various internal and external factors, which may act as enablers or barriers to adoption (Cragg and King, 1993; Dandridge and Levenburg, 2000; Lefebvre et al., 1991; Mehrtens et al., 2001; Walczuch et al., 2000; Windrum and De Berranger, 2003).

Durkin & McGowan (2001 a, 2000b) believe that in order to develop e-business in the entrepreneurial small firm, this must be contingent on the degree to which competencies such as vision, value, technical ability and control can be developed. The owner-manager must possess innovative, opportunity-focused characteristics and be open to change. Qirim (2007) found that CEO’s innovativeness was the only determinant of external-email adoption. CEO’s involvement was found to be the only determinant of Intranet adoption in New Zealand. Bayo-Moriones & Lera-López (2007) have highlighted the need to study the importance of establishment size, multinational ownership, and a high-skilled workforce in ICT adoption. Quality control systems and team-based organization of work were also found to play a relevant role in the diffusion of certain elements of ICT within firms. Internal factors are

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Table 2: Benefits of ICT to SMEs

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Authors</th>
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</thead>
<tbody>
<tr>
<td>Leveraging inherent strength (size)</td>
<td>Arbore &amp; Ordanini, 2006</td>
</tr>
<tr>
<td>Improved communication, establishing competitive advantage, marketing and sales promotion, and improved information search, cost cutting</td>
<td>Ellsworth &amp; Ellsworth, 1995; Sterne, 1995; Evans &amp; Wurster, 1997; Poon &amp; Swatman, 1999; Fillis &amp; Wagner, 2005</td>
</tr>
<tr>
<td>24-hour service</td>
<td>Quelch &amp; Klein, 1996; Hamill &amp; Gregory, 1997</td>
</tr>
<tr>
<td>Improved customer service</td>
<td>Evans &amp; Wurster, 1997; Zineldin, 2000; Tse &amp; Soufani, 2003; Fillis &amp; Wagner, 2005</td>
</tr>
<tr>
<td>Improved procurement procedures and staff recruitment</td>
<td>Taylor, 2001</td>
</tr>
<tr>
<td>Supplier management</td>
<td>Evans &amp; Wurster, 1997; Zineldin, 2000</td>
</tr>
<tr>
<td>Inter-firm linkages, value addition to services, manufacturing</td>
<td>Wattanapruttipaisan, 2002-03</td>
</tr>
</tbody>
</table>
important for the small business, where organizational and managerial factors seem to integrate
due to the high locus of control exerted by the key decision maker (Boone et al., 2000).

The determinants of the intention to use an information technology such as the Internet were
established by Chang & Cheung (2001) and complexity and long-term consequences were
not found to influence the intention to adopt the Internet/WWW. Mirchandani & Motwani
(2001) investigated the factors that differentiate adopters from non-adopters of e-commerce
in small businesses and found that factors such as compatibility, perceived usefulness, external
pressure, perceived ease of use, and organizational readiness were found to be statistically
significant as determinants of e-commerce adoption. Compatibility between e-commerce
and the firm's culture, values, and preferred work practices as well as consistency with the
existing technology infrastructure turned out to be the most influential ones as perceived by
top managers. (Grandon & Pearson, 2002).

Subramanian & Nosek (2001) and others (e.g. Barua, Kriebel, & T. Mukhopadhyay 1995; Tallon,
Kraemer, & Gurbaxani, 2000) have attempted to identify the strategic value of certain
information technologies (IT) as seen by top managers and others (e.g. D Adams, Nelson, &
Todd, 1992; Lederer, Maupin, Sena, & Zhuang, 2000), primarily through the Technology
Acceptance Model. A vast number of studies regarding the strategic value of IT have been
carried out over the last decade. These studies have typically focused on the relationship
between IT investment and the firm's performance. For example, Hitt & Brynjolfsoo (1996)
investigated how IT affects productivity, profitability, and consumer surplus. They found that IT
increases productivity and consumer surplus but not necessarily business profits. Barua et al.
(1995) concluded that there are productivity gains for firms from IT investments.

Tallon et al. (2000) argued that executives rely on their perceptions in determining whether
or not a particular IT investment creates value for the firm. Amit and Zott (2001) have focused
on identifying the perceptions of top management regarding the strategic value of
e-commerce.

Subramanian and Nosek (2001) created an instrument to validate the strategic value that an
Information System (IS) may provide by testing three factors that were found to create strategic
value in IS: operational support, managerial productivity, and strategic decision aid.

Beatty et al. (2001) found that the factors involved in the corporate website adoption process
differ depending on the time in which the technology has been adopted.

There is research in SME e-adoption and IS management, but little on SMEs e-adoption in the
context of supply chains. A number of issues emerge from research in SME e-adoption and
supply chain management. SME e-adoption approaches appear to be different to those used
by large firms (Cox et al., 2001). Levy & Powell, 2001 demonstrate that the introduction of
ICT into SMEs is fragmented, based around operational support and transactions processing.
Typically, owner-manager interest and enthusiasm drive ICT adoption, though often in an
unplanned fashion. Customer pressure is one of the main factors in SME e-adoption.

Various models that address the appropriate use of e-commerce and IT-induced business
transformation have been proposed. Yet, these models tend to be derived from research in
large firms; and there is little investigation of the applicability of e- across all businesses in supply chains. For example, approaches used in managing websites with IT developed for large firms may not be applicable to many SMEs (Tesar & Moini, 2001). The problems encountered by SMEs are often different from those of large firms and require different approaches (Blili & Raymond, 1993). Some of these models have been developed by Garcia-Dastugue & Lambert (2003); Kraljic (1983) with their focus on contingency and (Willcocks et al. (2000) and Venkatraman, 1991), with their focus on development. The SME focus-dominance model (Levy et al., 2001) addresses both the contingent and development issue. The Internet adoption model with its focus on factors that influence SME decisions was given by Mehrtens et al., (2001). The e-marketplace model was given by Kaplan & Sawhney (2000).

Recent work focuses on issues such as the service sector, e-opportunities and barriers where e-business models are formed on a network perspective (Ramsey et al., 2003).

There are differences across industries in terms of the ability and willingness to develop e-business and, industry-specific competencies are often needed in order to grow the business (Carson & Hill, 1992; Drew, 2003; Poon, 1998; Ramsey et al., 2003).

Firm size, degree of exporting, awareness of benefits and customer type appear to dictate how information communication technology (ICT) strategies develop in the small firm (Lauder & Westall, 1997). In order to encourage the use of e-business opportunities, Government programmes of assistance are offered (Jutla et al., 2002). Matthews (2007) has identified key variables and challenges facing SMEs in harnessing ICT for growth, and indicated a need for more general support to the sector to accompany government subsidies.

Although studies on the adoption of e-commerce by SMEs are relatively recent, research antecedents are well established. Rogers' (1995) work highlights the important roles of change agents (intermediaries) in influencing innovation decisions, including developing a need, establishing communication, diagnosing problems, creating an intent to change and then action. Intermediaries may also act as a means to facilitate the adoption of ICT as observed by Swan & Newell (1995) and Newell et al. (1998, 2000).

Within the specific domain of ICT adoption by SMEs, recent studies utilizing Rogers'(1995) model of innovation include Kendall et al. (2001) and Mehrtens et al. (2001). Technology-push and need-pull models of technology innovation adoption in information systems (IS) (Zmud, 1984; Chau & Tam, 2000) have been proposed. These models typically identify 'push' factors or facilitating forces such as government initiatives or technological drivers, and 'pull' factors or restraining forces such as organizational crises. Redoli, García-Díez and López-Coronado (2008a) proposed a model that helps to understand how an enterprise is using information and communication technologies (ICTs) and "how" and "when" a company should incorporate new technological elements. The model can also be applied to marketing research to understand the small and medium enterprises (SMEs) emergent market related to ICTs and to plan government policies devoted to fostering ICT introduction in SMEs.

There has been emphasis on the strategic logic in the decision to adopt ICT (Blili and Raymond, 1993; Daniel et al., 2002; Kowtha and Choon, 2001; Sadowski et al., 2002). Blili and Raymond...
(1993) concluded that Information Systems planning needed to be integrated with business strategy. Hagmann and McCahon (1993) found that few SMEs plan their adoption of IS and that the limited planning that was evident was focused on operational improvements and was not concerned with competitiveness. Thus, there seems to be a lack of overall effective planning for all the aspects of business. Southern and Tilley (2000) observed that there is an incremental build up of knowledge and expertise in ICT to be established within the firm. This may be due to problems in adopting increasingly complex e-business applications. This view appears highly pertinent. Lockett, Brown (2006) emphasize the need to analyze social factors before the initial decision to adopt by SMEs can be made as these can identify the antecedents that need to be satisfied.

The researches have focused upon various factors including those relating to owner-skills and vision, technology innovation, government assistance, intermediaries, operational support and so on. A wide spectrum of issues has been considered in this area (Table 3).

Table 3: Factors determining adoption of ICT in SMEs

<table>
<thead>
<tr>
<th>Factors</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational competencies (vision, value, technical ability and control)</td>
<td>Poon, 1998; Carson &amp; Hill, 1992; Durkin &amp; McGowan, 2001 a, 2000b; Drew, 2002; Drew, 2003; Ramsey et al., 2003</td>
</tr>
<tr>
<td>Compatibility, perceived usefulness, external pressure, perceived ease of use, and organizational readiness</td>
<td>Mirchandani &amp; Motwani, 2001; Cox et al., 2001; Grandon &amp; Pearson, 2002</td>
</tr>
<tr>
<td>Productivity, profitability, and consumer surplus</td>
<td>Brynjolfsoon, 1996</td>
</tr>
<tr>
<td>Time of adoption</td>
<td>Beatty et al., 2001</td>
</tr>
<tr>
<td>Operational support and transactions processing</td>
<td>Levy &amp; Powell, 2001</td>
</tr>
</tbody>
</table>
6. Barriers in Adoption

A number of studies have been conducted to identify the barriers in adoption of ICT by SMEs. One reason which inhibits adoption is the perception by SMEs that they obtain fewer benefits than anticipated (Cox et al., 2001). Access to finance is also a major difficulty for some small firms (Doole and Lowe, 1999; Thong, 2001; Fillis & Wagner 2005).

The use of Information Communication Technology (ICT) is low in SMEs because of lack infrastructure, high cost Internet connection and lack of skill in ICT use. For example, 70% of SMEs in Indonesia lack skill in ICT use (Setyawati 2008). SMEs in the Asia-Pacific region have been slow to adopt ICT due to poor telecommunications infrastructure, limited ICT literacy, the high cost of ICT equipment, and incomplete government regulations for e-commerce (Vadim). Ninety percent of Thai SMEs still use basic communication technology such as fixed phone line and fax, and only 1 percent use CRM software. The PricewaterhouseCoopers (1999) Report contains a useful survey of the main issues and options relating to e-commerce and SMEs in the Asia Pacific Economic Cooperation (APEC) region. The United Nations Conference on Trade and Development (UNCTAD) (2001) gave an analysis of e-commerce in the context of low-income countries and economies in transition, specifically China. In India, the majority of Small and Medium scale categories are still in the nascent stages of ICT adoption. They lack the knowledge of business performance improvement potential of ICT. ICT is used as office administration and accounting automation tools at best. One cause of limited adoption is the lack of dynamism between ICT firms and SMEs outside the ICT sector. ICT firms have not provided goods and services tailored to SMEs in the past because demand from SMEs has been low. However, their demand is low in part because ICT products available in the market are too complex and expensive. The result is a vicious cycle of limited supply and limited demand that ultimately excludes SMEs from the benefits of ICT. (Small and Medium Enterprises and ICT/SME Adoption, n.d.)
Although SMEs have the advantages of flexibility and rapid response to change, there are also disadvantages due to their absolute size limitations, which may have increased due to increased global competition (Narula, n.d.). According to the OECD (1998), there is a positive correlation between adoption of ICT and firm size. SMEs in all sectors in the prosperous regions of the UK, France and Italy use ICT, but only in a rudimentary fashion (Baptista, 2000).

Many small firms are failing to develop an appropriate strategy and have not, as yet, realized the cost and time benefits of e-business (Quayle, 2002). There is a degree of dissatisfaction with the perceived failure to deliver the early promises of the new business approach (Wallace, 2000). This is accompanied by a lack of research in the area of small firm e-business development and an under-estimation of the importance of the small firm in general (Quayle, 2002). Challenges for SMEs to harness ICT also include high initial set up costs, problems in the payment mechanism, low usage of credit cards, and lack of strategic focus that could build upon power on ICT, amongst others (Bhattarai).

Knol, & Stroeken, (2001) found that a number of factors that affect the adoption of e-commerce relate to owner/manager characteristics, including the lack of knowledge of how to use the technology and low computer literacy. Mistrust of the IT industry and lack of time are two other factors that affect the decision to adopt e-commerce and SME owners’ concerns about return on their investments (Akkeren, J. & Cavaye, A.L.M., 1999). Kapurubandara and Lawson (2006) have classified the various factors identified as causes for the reticence about internal barriers, which can be resolved within and by the organization and external barriers, which need to be addressed either by government intervention or by collaboration of SMEs. The challenges faced by the SME sector in adopting ICT could be listed as follows (Veerawalli, 2008):

- Cost of investment in ICT infrastructure, software and application packages;
- Low PC penetration in semi urban / rural areas (In the four most populous regions in Asia -India, China, Indonesia and the Philippines- about 75% of small businesses that employ under 100 staff were not found to own any computers (Raymond Tan);
- Communication network and bandwidth availability;
- Availability of funding for the initiatives;
- Lack of awareness / appreciation of the benefits of automation;
- Confusion regarding choice of right products;
- Problems in acquiring and retention of technical personnel to manage ICT.

There is also limited knowledge, awareness and skills on the part of SMEs concerning the promise and requirements of ICTs as well as e-business. Moreover, significant barriers exist in the form of insufficient access of SMEs to ICT infrastructure, hardware plus software of suitable quality, and at affordable cost in terms of time and money.

Potential barriers include increased competition with the larger firms as they attempt to follow small firm strengths such as flexibility and closeness to the customer (Kleindl, 2000). The technical and Internet-specific knowledge and competence of the smaller firm, the rate
of market growth, the rate of specific industry innovation, competitive technological competencies and industry structure also have a considerable impact on how e-business develops (Drew, 2002).

ICT adoption among small businesses in India is less than 30%, and if the IT firms in the SME segment are not considered, the number will be significantly less. The main reasons for low adoption are: reluctance to adopt technology, high cost of enterprise solutions and unsuitability for Indian markets, low level of telecom density especially in rural and semi-urban areas and lack of funds.

Owners and managers suffer from various apprehensions like low benefits, high costs, mistrust of IT industry and so on, which may be due to lack of proper information and awareness. Table 4 summarizes the barriers identified by various researches.

Barriers to adoption in developed and developing countries may be different. There seem to be very few or no researches on studying this difference.

**Table 4: Barriers in adoption of ICT in SMEs**

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception of low benefits</td>
<td>Cox et al., 2001</td>
</tr>
<tr>
<td>Finance</td>
<td>Doole &amp; Lowe, 1999; Thong, 2001; Fillis &amp; Wagner, 2005; Veerawalli, 2008</td>
</tr>
<tr>
<td>High cost internet, lack of skill and knowledge of IT, poor infrastructure</td>
<td>Akkeren, &amp; Cavaye, 1999; Drew, 2002; Setyawati, 2008; Veerawalli 2008; Vadim; Small &amp; Medium Enterprises &amp; ICT/SME Adoption; Bhattarai, n.d.</td>
</tr>
<tr>
<td>Lack of customized ICT products for SMEs</td>
<td>Small &amp; Medium Enterprises &amp; ICT/SME Adoption, n.d.</td>
</tr>
<tr>
<td>Inability to realize the cost and time benefits of e-business</td>
<td>Akkeren &amp; Cavaye, 1999; Quayle, 2002</td>
</tr>
<tr>
<td>Lack of research in the area</td>
<td>Scott Morton, 1991; Burgess, 2000; Quayle, 2002;</td>
</tr>
<tr>
<td>Non attainment of expected benefits</td>
<td>Fathian, Akhavan &amp; Hoorali, 2008</td>
</tr>
<tr>
<td>Lack of strategic focus</td>
<td>Wallace, 2000; Veerawalli, 2008</td>
</tr>
<tr>
<td>Mistrust of IT industry</td>
<td>Bhattarai</td>
</tr>
<tr>
<td>Classification as Internal barriers (within organization) and external</td>
<td></td>
</tr>
<tr>
<td>barriers (outside organizations)</td>
<td>Akkeren &amp; Cavaye, 1999</td>
</tr>
<tr>
<td>Competition with the larger firms</td>
<td>Kapurubandara &amp; Lawson, 2006; Kleindl, 2000</td>
</tr>
</tbody>
</table>
7. Suggestions

Many suggestions have been offered, and models have been proposed to improve and optimize the assimilation of ICT in various SME operations.

For the growth of SMEs, Poon (1998) identified the importance of the interplay between market conditions, supply chain issues, industry characteristics, particular style of management, innovation ability and entrepreneurial thinking. Jones et al (2003) developed a model of Web-based commerce adoption. Lohrke et al. (2006) highlight the benefits of reducing SME's transaction costs. Gupta (2007) proposed a cooperative model of learning to make each enterprise more competitive.

Initiatives like the "VIKAS" Project in India (collaboration between NMCC and Microsoft India), which aims at stimulating ICT absorption in the manufacturing sector may be a positive step in that direction. (http://www.projectvikas.com/)

Business process re-engineering (BPR) is recognized as a means of either improving efficiency or of enabling full value-added changes to be achieved, within the small- and medium-sized enterprises (Levy and Powell, 2005).

Wong & Lu (2005) identified the key factors of successful computerization in SMEs, which include focus on allocating their limited resources in implementing information systems efficiently. Setting up a good plan is a critical step, and the success of information systems strongly depends on external information technology expertise, the cost incurred to improve the environment within an enterprise for implementing information systems, and the support of chief executive officers. SMEs adoption of e-business is different to that of large firms. The implication is of a need for a contingent, SME characteristic-based approach to determining how SMEs employ ICT, rather than a 'one size fits all' solution (Zheng etal, 2004).

Bhattarai suggests that competitiveness of SMEs in the emergent business environment may be increased by price restructuring, customized services to IT product/service users, cultural and intellectual shifts, among other measures. Managers need to align ICT adoption and the strategic focus of the firm more consistently (Bayo-Moriones, Lera-López 2007).

Poon and Swatman (1999) identified the importance of entrepreneurship and managerial support as the way in which sustainable advantage can be obtained. As the small firm moves from traditional business to e-business, this must be accompanied by the development of appropriate knowledge and competence among the employees. e-business competitive advantage can be achieved through the exploitation of relevant hard and soft competencies. Fillis and Wagner (2005) believe that it can be achieved by thinking entrepreneurially about e-business issues. The internal competencies of the organization are central to the efficient production of products and services through the construction of profitable relationships with customers (Schupel et al., 1998). The small firm grows through its ability to exploit its internal knowledge competencies and the entrepreneurial small firm is best placed to do so with its higher levels of creative thinking (Blackle, 1995; Fillis, 2002r). Thus, there is a need to view SME e-business development in terms of how well the owner-manager and related key
decision makers can develop and exploit an appropriately built competency portfolio (Fillis and Wagner 2005).

Though many suggestions have been offered in the form of business models, restructuring and optimum utilization of firm resources and employee training, researches need to provide specific solutions for problems in developed countries and in developing countries. Differentiation may also be made on the basis of location, for example, rural area and urban areas. The same solution may not fit problems everywhere.

8. Conclusion and Implications for Future Research

Researches have identified SMEs as a driver in boosting the economy of a country. Researches have emphasized the need for adoption of ICT by SMEs in today’s globalized world. Its adoption is still low, particularly in developing countries. Researches in the recent past explored various dimensions of application of ICT in big firms only, but now researchers have begun to explore the implications of adopting ICT in small firms also. There are a number of factors that affect the decision of owner-managers of these enterprises to adopt ICT. These factors are internal and external, some are related to owners while others are related to employees. Studies have also explored the barriers to adoption and ways have been suggested to overcome these barriers. Various business models have been developed and critically analyzed. Though differences between small and large firms have been studied, differences between developing and developed countries also need to be identified in the context of ICT adoption. Models also need to be proposed for problems arising from issues, which are specific to developing countries. Researchers also need to focus on sector specific (for example, garments and food processing) issues of SMEs in ICT adoption, which seems to have caught little interest.

Another issue that seems to be little explored is whether the gender of the owner-manager has any impact on ICT adoption by SMEs.

The studies clearly indicate that ICT adoption is still very low in SMEs, but whether the increased adoption of ICT by SMEs will result in increased researches in this area or whether the increased researches will lead to increased adoption of ICT by SMEs remains to be explored.

References


Adoption of Information and Communication Technology in SMEs


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