

Full Length Research Paper

The adoption of new and innovative knowledge by small and medium enterprises of Iran: Opportunities and constraints for growth

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Accepted 24 November, 2019

The purpose of this article was to explore the capacity of Small and Medium Enterprises (SMEs) in absorbing and managing knowledge as a prior condition to innovations and entrepreneurial growth. Drawing the findings from more than 1,500 SME owners/ managers of the ICT sector in Iran, across regular quarterly Small Enterprise Research (SER) team surveys and from other large scale studies, this article examined the effects of experiential and formal knowledge on the development of SMEs absorptive capacity. The mixed method (explanatory type) was used as the research method. There were significant effects, such as age, education and size (of what) influence SME acquisition and assimilation of knowledge. Primarily, it was the small firms with 15 employees or less that had the capacity to absorb and use new knowledge, especially those with higher educational levels and cleared growth objectives. These firms were not startups, but tend to be younger firms with younger founders. Given the main policy aim, of what, was the development of clusters and knowledge-based firms, policy makers should focus on SMEs that are recently started by graduates or people with technical qualifications. As such, educators need to develop technology and innovation management programmes for these firms. This article made an important contribution to the identification of priorities for public SME development support and areas where business schools and enterprise trainers could maximize their economic and developmental impact.

Key words: Innovation, entrepreneurialism, knowledge management, small enterprises research paper.

INTRODUCTION

SMEs, as an engine of growth, play a particularly important role in developing countries for poverty reduction which have attracted the attention of scholars in recent years. Predominantly, SMEs of the ICT sector have been one of the most complex and fastest growing industries for several years. A higher number of the owners/managers of SMEs in this sector are educated.

Also, the trend of this sector indicates that new product development (NPD) is based on innovation and there are still a lot of opportunities enhancing its exploration. Public policy interest in Iran's four million or so small and medium enterprises (SMEs) springs from three perceived SME strengths:

- (1) Their role in promoting flexibility and innovation.
- (2) Their labor market functions in creating jobs and absorbing unemployment.
- (3) The huge size of the sector (99% of Iran firms are just under 50% of jobs).

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This article is concerned mainly with the first of these functions ascribed to the SME sector. The expected role of entrepreneurial SMEs as the key source of competitive innovations is an expectation that reflects Schumpeter's (1934, 1942) continuing influence.

To survive in the new competitive environment, no enterprise can afford to stand still. All have to be open to new ideas, new ways of working, new tools and equipment, and should be able to absorb and benefit from them. A policy to enhance innovation must be present in a modern enterprise policy as one of its main components. This means buttressing the enterprise policy by measures specifically directed at encouraging the emergence and growth of "first mover" firms, and the flow of innovation from them into the enterprise sector as a whole. However, more than three decades of research, since the seminal Bolton Report in 1971, indicate clearly that these expected benefits from the sector are derived mainly from the activities of a relatively small proportion of entrepreneurial SMEs.

Majority of SMEs do not employ other people (Small Business Service, 2004), and of those that do, only an active entrepreneurial minority have a strong propensity for growth, research and development (R&D) or innovation (Talebi, 2000). It is the development of these small entrepreneurial firms, with their capacity to make effective use of technology transfer, R&D, networking and knowledge sharing and creation that are the real focus of policy makers and of this article. The key issues, which are outlined through a consideration of relevant research and publications on the knowledge needs of SME owners/managers to include a review of recent literature on the absorptive capacity of firms, are explored through the findings of regular, quarterly surveys of small firms in Iran. These surveys enable the effects of age, levels of education and growth-motivation on SME owners to be examined in relation to the adoption and generation of innovations in small enterprises in Iran. The main research questions addressed were: Are there significant differences between SMEs with respect to absorptive capacity as indicated by levels of education, staff development, growth orientation and propensity to innovate? Are there significant difference between high and low absorptive capacity firms with respect to growth-orientation, sales performance and adoption of ICT?

LITERATURE REVIEW

Much that is written about global competition and knowledge management tends to reflect on the experiences of large national firms and multinational corporations. The main impact of global competition and

knowledge management on SME tends to be mediated through effects on local economies and larger organizations. Entering into the global competition is a sign of successful entrepreneurs in a knowledge base economy. In addition, facing tougher resource and time constraints, SMEs also face tougher competition for necessary competences and skills in local labor markets, partly due to a poor supply of such skills and partly due to an intensified competition from larger firms. In its 2002 report on work-based learning in SMEs, Iran's vocational skills development agency (Talebi, 2002), identified a number of critical skills' shortages among different sectors of SMEs.

The concern with the nature and importance of the knowledge-based economy has given rise to a number of efforts to distinguish between different conceptions of knowledge. Knowledge takes two forms: the first is the observation, classification, measurement and cataloging of natural phenomena, while the second concerns the establishment of regularities and principles that allow for the interpretation of observed phenomena. Although science is central to this conception of propositional knowledge, it also includes a great deal of practical information about the fundamentals of nature (Wolfe, 2006). Also, both traditional neo-classical models and more recent evolutionary or neo-Schumpeterian models in economics appreciate the link between technological innovation and long-term economic growth (Audretsch et al., 2002).

The evolutionary approach to innovation and economic growth emphasizes the complex, uncertain and interdependent nature of technological change. Central to this conception of the process of innovation is the role of firms and entrepreneurs. These individual economic agents and organizations are endowed with an access to different knowledge bases in different sets of organization and technological capabilities and even with different risk profiles. The innovation process within the firm is characterized by uncertainty and develops through a variety of heuristic search techniques. The firm-specific knowledge base is the set of information inputs, knowledge and capabilities that they use to support their production activities (David and Foray, 1995). They summarized the policy challenges as:

In a fast-changing world of work, the ability to adapt and develop new learning and skills is a crucial ingredient in a successful economy. Globalization and the knowledge-driven economy require Iran to develop a more highly-skilled workforce in order to compete within the high-value-added sectors of the world economy (Curran et al., 1996, p. 14).

In spite of these strong pressures to develop their capacity, however, the report also acknowledged that SME participation has been very poor and that most of the trainings are informal, confirming earlier research that this is particularly so among the very smallest firms (Curran et al., 1996) The average knowledge base in the SME sector, especially among micro firms, is low compared to larger organizations. The report concluded that workforce learning is very important in developing knowledge in firms for survival and growth but that “there are other ways in which the workforce may be developed and a wide range of methods may be used” (Curran et al., 1996, p. 17). Increased use and commercial application by SMEs of innovations, particularly the more advanced information and communication technologies (ICT) and related services, are seen by policy makers as the key to improved competitiveness and a knowledge economy.

There is little doubt that the increased diffusion of ICT applications and pressures from global competition are already having an effect on capabilities required for managing a successful SME. Indeed, this has been evident for some time. For instance, Freel (1999) identified the major skills gaps that impede successful innovation in SMEs as: technical skills in the workforce, managerial competency and poor marketing skills (page, 150). If small firms are to fulfill their expected innovative function, it is important to better understand the causes and effects of these knowledge, capabilities and skills gaps in relation to SME growth. Some 20 years ago, Cohen and Leviathan (1990) identified the problems suffered by firms, with such gaps in capabilities and knowledge, in effectively managing inwards technology transfer and R and D programmes. In their words, an organization needs prior related knowledge to assimilate and use new knowledge. They termed this as the firm’s “absorptive capacity”, a concept that has subsequently been broadened to include a firm’s overall capacity for learning, implementing new knowledge, disseminating new knowledge internally and making use of new resources, including new technologies. Absorptive capacity is a function of the organization’s existing resources, existing tacit and explicit knowledge, internal routines, management competences and culture. In entrepreneurial SMEs, it is likely that this will be largely reflected in the development, experience and motivation of the owner/manager and key staff members.

Zahra and George (2002) further developed the concept of absorptive capacity to include the organizational routines and processes by which firms operate and manage knowledge. They identified four distinct areas where knowledge needed to be managed in successful firms:

- (1) Acquisition
- (2) Assimilation
- (3) Transformation and
- (4) Exploitation.

Acquisition and assimilation of knowledge were seen as potential absorptive capacity, while transformation and exploitation of knowledge represent the realized absorptive capacity (Zahra and George, 2002). Liao et al. (2003) conclude that SMEs with higher levels of absorptive capacity tend to be more proactive, whilst those with modest absorptive capacity will tend to be more reactive and that “reactive and proactive modes of SMEs’ behavior should remain rather stable over time”.

Another distinction, which is very relevant to SMEs, is that absorptive capacity involves external knowledge acquisition and internal knowledge dissemination within the firm (Heeley, 1997). According to Liao et al. (2003), potential absorptive capacity has received disproportionately less empirical scrutiny when compared to the realized absorptive capacity. This means that less attention has been paid to how firms acquire and use external knowledge and this is where SMEs seem to be at a disadvantage, which is the focus of this article.

Absorptive capacity: Today, the management of knowledge acquisition and use is crucial. This immediately solicits the question, what is knowledge? Drawing on distinctions between rational and empirical knowledge that trace their origins back to classical times and the age of enlightenment, Spender (1996) critiques the positivist view of direct knowledge of a “real” world to suggest that organizational knowledge reflects, at least, four dimensions, which are individual versus social and tacit (hidden or subconscious) versus explicit (codified and conscious) knowledge. The relationship between these dimensions and the different types of knowledge that they describe is fluid and dynamic (Spender, 1996) and the knowledge-capture is a process rather than a one-off event (Jones and Craven, 2001). With respect to SMEs and the focus of this article, there are generally two main areas where the effective management of these various types of knowledge is crucial to growth or survival:

- (1) The functional areas of the business, which relate to the people in the firm, and
- (2) Strategy and the need to remain competitive, or at least viable, which relate to the firm itself as an organization.

The degree of functional knowledge in a firm is related to the level and relevance of formal training, experience and the response by firms to their perceived need for capability

in the functional areas. In turn, this seems to be related to levels of education, source of knowledge acquisition (college, university, consultant, peers, etc.) and experience. In Iran, some 16% of the workforces are university graduates, but the proportion is higher among younger SME owners and those in manufacturing and business services (experiential learning is still enormously important and, indeed, may also be associated with higher levels offering normally, acquired knowledge) (Talebi, 2000). While accepting that their tougher resource constraints do inhibit formal training, information scanning and R and D in SMEs, the knowledge management model, which is based on knowledge sharing and, through constant and open communication (often an SME strength), the explicit making of often buried or tacit knowledge held by all employees, can also be applicable to small firms. Combination of knowledge and creation of new knowledge is the innovative process that lies at the heart of knowledge management. Indeed, there are a number of SMEs, mainly those involved in tight networks, clusters or value-chains, where knowledge sharing is fundamental to their business (as opposed to others where competitive edge comes from the more efficient management of existing routines that are fairly common across an industry).

For most types of SMEs, there are a number of areas of relevant knowledge, where the existing organizational and technical knowledge is based on the acquisition of new knowledge (usually through learning, training or transfer) and the creation of new knowledge (innovation and operational improvements) (Zahra and George, 2002). Thus, SMEs face major challenges, like: keeping the firm's capabilities, resources and routines up to date; maintaining the owner/manager's entrepreneurial and management competences and acquiring new knowledge, which raises issues concerning the source of information (formality/informality and education /experience) (Talebi and Shervini, 1999). ICT is seen as providing support for these processes, both internally and, also in relations, externally with other firms. The development of ICT-mediated formal and informal links between SMEs and the growth of virtual clusters or industrial districts fits the knowledge management approach, but it is an under-researched area, and as such, little is yet known about it. In its final report, the Iran National Skills Department (2000) was very clear that it saw networks and clusters as the way for SMEs to overcome their skills and knowledge gaps. It recommended the development of new sectoral and local learning networks to support the training and development needs of clusters of small and medium sized businesses. Although there are few direct studies on knowledge management and SMEs, a 1995 survey

conducted by the office of union business service (OUBS) among some 2,500 SME owners revealed that growth-oriented owners were more likely to be communicative and participative in their management styles and more likely to network (Gray, 2004). These are the prerequisites of the effective knowledge management that underpins the construction of entrepreneurial absorptive capacity. During 2001 to 2003, Entrepreneurship Research Institute (ERI) conducted an in-depth cross-Iran study of SME networking and the effects of ICT on existing networks.

The study confirmed that most SMEs belong to at least one network and that the main drivers for networking are the exchange of business and technical knowledge, as well as more general social interactions among smaller firms. Later, ERI research, as part of a study into the determinants of management development, revealed the high growth SMEs to be more systematic and strategic in their management development policies, including having higher commitment to development from the top of the firm and identifying managers to be responsible for its implementation (Gray, 2004). These are practices associated with learning organizations that can easily benefit more from using networks and clusters to use and create new knowledge. This is also a process where the increased connectivity of ICT, offering faster and broader access to external knowledge as well as scope for capturing and sharing internally generated knowledge, might be expected to help develop absorptive capacity and innovation. The key role played by ICT in the management of knowledge in SMEs was specifically addressed by Corso et al. (2003) who stated that ICT applications can "play a key role in this process. By providing quick and easy access to external sources of knowledge and new and more intense communication channels with partner organizations, ICT can erase traditional constraints on SMEs innovation ability, while leveraging their flexibility and responsiveness". Increasingly, the internet helps SMEs to participate in useful networks or pursue commercial and industrial linkages without a strong need for spatial proximity. In general, ICT adoption and use appears to be related to the size of the firm, with larger and growth-oriented SMEs using far more ICT applications and functions than other firms (Talebi, 2002).

This suggests that absorptive capacity is also strongly linked to the access of resources inside the firm (which appears to be one of the main effects of size), as well as to external expertise. However, smaller SMEs are generally resistant not only to training, but also to other forms of wider participation. The human resource practices in many SMEs are often not conducive to the creation and exchange of knowledge. Generally, SMEs

also engage in less management development activities than larger firms. Managers in SMEs are much less likely to have formal appraisals or discussions on their training needs (in a 2004 Iranian study), in that 41% of SMEs reported no appraisal system compared to 27% of large firms (Talebi, 2002). It appears that a strategic orientation towards growth is a much stronger determinant than the size of firm not only of internal management and staff development, but also of positive attitudes towards knowledge acquisition (Shervini and Talebi, 1999). However, there is no universal acceptance of the approach that sees an increase in the rate and success of innovation being driven by the development and improvement of absorptive capacity in growth-oriented SMEs. The 2000 EC communication that is quoted presented a different model based on public-private partnerships that enhancing technology transfer to SMEs and their capacity to absorb technology is a traditional pillar of innovation policy.

A demand-led approach, the transfer of tacit innovation know-how and the physical proximity to the source of the technology are seen as critical factors for success. Policy-makers are increasingly rejecting the dichotomy between upstream stimulation of R&D and downstream technology absorption (Desouza and Awazu, 2006). Under the system view, the underlying barriers to innovation arise from differences of a mainly cultural or managerial nature between the performers of research in the public sector and those who take up the results in the private sector. The increased emphasis on the private sector in its double role of technology user and translator of market needs into research problems has led to the emergence of a new policy goal of improving the research/industry interface (Yadollahi and Talebi, 2009). Absorptive capacity theory, and most current entrepreneurship theory, assumes a more organic, even random, view of the innovation process, driven by an ability to identify and exploit opportunities. It is accepted that most R&D, especially large budget and longer-term R&D, is conducted in large organizations (private and public, including universities).

Opportunities are identified and acted upon according to the SME's absorptive capacity (knowledge base and organizational capability) and the inclination of the owner/manager. The source of many opportunities and the main way innovations are diffused in an industry and the wider economy is a result of "spillover" from the more R&D intensive firms rather than formal contractual collaborative agreement of the type envisaged in the 2000 EC document (page, 70). There are three main channels for spillover into small firms:

(1) Value-chain linkages between the SME and the larger

organization (these can be contractual sometimes, but not always).

(2) Normal labor market dynamics which see a flow of workers to and fro between large and small firms (each with different explicit and tacit knowledge of R&D innovations and SME capacities).

(3) The classic "blocked career" spur to entrepreneurship when the R&D or management teams leave a large organization, often with that organization's support, to pursue the commercialization of the innovation (often because the large organization cannot proceed, due to strategic or financial reasons).

(4) Finally, another important aspect of absorptive capacity theory is that absorptive capacity in an SME is enhanced significantly when the SME itself engages in its own R&D (Griffith et al., 2003).

This is not only an indication of the proactive entrepreneurialism of the small firm, but is also a very effective way of building up its internal knowledge base. To be in a position to conduct R&D indicates that a small firm is already one of the minority innovative SMEs. There is also evidence that absorptive capacity and knowledge transfer are both enhanced when firms operate in the same broad industries (Jones and Craven, 2001). This implies that there are strong industry effects as well as educational and experience effects in the development of strong absorptive capacity. Certainly, significant differences between manufacturing and non-manufacturing SMEs have been found with respect to how SMEs perceive and exploit opportunities, which are a key entrepreneurial function (Schwartz et al., 2005). Thus, policy might be better directed at boosting the absorptive capacity of particular sectors of SMEs. Although this aspect of policy is of interest, it is not the focus of the article, which instead focuses on the characteristics of high absorptive capacity SMEs, such as: positive attitudes and motivation in relation to growth, their own knowledge acquisition (formal and experiential), development of their staff, experiencing change and adoption of innovations and new technologies.

METHODOLOGY

We used the mixed method (quantitative and qualitative) of research, which is an explanatory type of method, in order to gather data. Quantitative method was done through survey, while qualitative method was done through deep interview with experts (Creswell, 2003). Sampling of the quantitative sector was done through stratified random sampling, whereas the qualitative sector was non-probably targeted in continuing elaboration. Instrumentation of data gathering in quantitative method was done through a questionnaire and its validity was measured by content validity.

Table 1. SME growth intentions by qualifications in 2004 (column %).

	Degree	Professional	Technical/vocational	School	None	All
External courses	45	51	52	34	30	43
Time off for study	33	40	43	29	30	34
Internal courses	23	31	35	25	27	27
Mentors/consultants	13	14	11	12	11	13
Others	6	4	5	8	4	4
Informal/none	39	29	30	43	49	37
Sample (n)	259	159	79	122	73	692
%	37	25	11	19	11	100

Source: Small enterprise research team.

Also, its reliability was measured by Cronbach's α which became 0.87. Finally, considering the interval scale in the quantitative sector, we analyzed them based on the descriptive statistical method (Dispersion and central) and the correlation coefficient of Pearson. Also, content analysis and open coding were used to analyze qualitative data. Moreover, this article draws on findings from Iran quarterly national surveys conducted recently (2003 to 2005) by the independent non-profit small enterprise research team (SER team), which is based on ERI and has been conducting, publishing and disseminating research on SMEs for the past 20 years. The samples for all these surveys were drawn from a wider SER team's database of mainly owner-managed SMEs which has been recruited and periodically replenished through a random selection of firms nationally.

Although, each survey presents a cross-sectional analysis of the overall state and performance of SMEs in Iran, including an exploration of a key issue in each quarter, there is an overlap of around 50% of common respondents from one quarterly survey to the next, allowing for key responses and trends to be tracked over time. The data for this article were gotten from the linked responses of three quarterly surveys on ICT adoption (2003/Q3 - 687 respondents), growth motivation, innovation and performance (2004/Q1 - 808 respondents) and the educational backgrounds of owners, training and development (2004/Q2 - 739 respondents), enabling an examination of the effects of high and low absorptive capacity (as defined by levels of education, experience, propensity to innovate and growth strategy) on actual growth and adoption of innovations (ICT applications). The analysis was carried out mainly as cross-tabulations (with χ^2 significance tests) using SPSS - 13.

FINDINGS

Absorptive capacity: Education

Educational levels have been found to be positively linked to levels of entrepreneurship, growth and the internal development practices associated with high absorptive capacity (Storey, 1994; Gray, 2004; Harding, 2003). Some 16% of the Iranian labor forces are

graduates holding degrees or equivalent, whereas 9% has other higher education qualifications and some 3% are found with other qualifications. The 12% of graduates who are self-employed is roughly in line with the general population, but a higher proportion of graduates run businesses that employ other people (which are the SMEs that are more likely to develop their absorptive capacity and to innovate). Indeed, the 2004 SER team quarterly survey (Table 1) revealed clearly that SME owners with no qualifications are more averse to growth than the other respondents. Innovation and competences that contribute to absorptive capacity are not confined to formal education or to managerial skills. Moreover, the technical competency is also essential.

Although graduates are more growth-oriented than the average and owners with no qualifications are more growth-averse, it is the owners with technical and vocational qualifications that appear to be the most growth-oriented. In addition, there are strong signs that the larger, growth-oriented SMEs provide more formal training for owners to also engage more in the informal and experiential learning activities that are important to the development of a firm's absorptive capacity (Gray, 2004). The survey also revealed (Table 2) that SME owners with higher academic, professional and technical qualifications continue to attend and provide their staff with a wider range of business related development courses and activities. As such, this table is based on multiple responses to questions, so significance tests were not conducted. However, it is clear that the less well-educated SME owners arrange fewer external and internal courses for their staff and are less willing to offer their staff time-off for study. In general, higher educational levels of owners/managers correspond to higher levels of management development activities, essential for the development of high absorptive capacity.

Table 2. SME owners with higher academic.

	Degree	Professional	Technical/vocational	School	None	All
Growth oriented	49	43	56	50	32	46
Growth averse	21	24	24	16	30	22
Exit/sell	30	34	20	34	38	32
Sample (n)	274	169	84	125	81	733

Note: $\chi^2 = 16.171$; $df = 8$; $p < 0.040$

Source: Small enterprise research team.

Table 3. Growth strategy by age of the owner (column %).

Strategy	<40 years	40-49	50-59	60+	All
Growth-oriented	70	58	39	38	48
Status quo	9	17	23	26	20
Exit	12	15	18	19	17
Growth-averse	5	6	11	12	9
Sample (n)	92	216	305	187	808

Source: Small enterprise research team.

experience. Many self-employed and micro firms exist on the margins of the economy where owners often expect to earn no more than a living as an individual or as a household. As such, the need for autonomy dominates as a career motivation. Moreover, growth which is past a certain point, and the development of capacity and capabilities, is often not on the agenda. Furthermore, if the mode of earning a living is also bounded by a certain lifestyle, that is, informal, anti-bureaucratic, alternative, individualistic, etc., decisions may be based on non-business criteria. This is particularly true of the individual that is self-employed and many small family businesses where there is even minimal growth beyond a personal earning capacity will involve employing another person and the taking of responsibility for providing wages for that person.

This is not a milieu that is conducive for the establishment of absorptive capacity or systematic, strategic innovation. In many cases, this may be related to the age of the firm and of the owner. SER team surveys reveal strong age and size effects with the older SME owners of the micro firms revealing a strong need for autonomy (which can inhibit sharing of knowledge) and the self-employed micro firm owners which are even more. In contrast, younger SME owners seem less concerned about the need to preserve independence which implies a stronger propensity to work with other firms. This has enormous implications for growth prospects of the sector and attitudes towards innovation and networking. Indeed,

SER team surveys reveal significant trends in age-effects on growth intentions, which is a useful indicator of behavioral and performance differences between SMEs. Growth-orientation declines with age as the desire to sell the firm increases, and as such, the desire to maintain a stable status quo also increases (Table 3).

Although growth-orientation declines with age as growth aversion increases, a rather large proportion of SME owners (38%) over the age of 60 years have the strategic objective of continuing to grow their firms. In general, reflecting how recent the upsurge in Iran graduate numbers is, older SME owners tend to have fewer formal qualifications. Younger SME owners/ managers, especially the under-40s, are clearly more growth minded and entrepreneurial, but some older, experienced SME owners still have a zest for growth. Furthermore, there are signs that proportions observe the need to innovate as the way of achieving that growth. There are few significant influences linked to the age of firms except that younger firms (that is, those operating for less than 5 years) are significantly more likely to be actively investing and have increased their sales (the older the firm, the stronger the desire to maintain their status quo, possibly a sign of increased risk aversion).

Links to innovation

In the first quarter of 2004, respondents were asked to

Table 4. Areas of innovation by age of the owner (Column %).

Innovation	<40years	40-49	50-59	60+	All
Products/service	54	55	54	48	53
Processes	56	51	49	42	49
Supply management	23	16	27	27	23
Distribution/marketing	40	37	41	45	41
Sample (n)	57	129	155	98	440

Source: Small enterprise research team.

Table 5. Areas of ICT adoption by age of the owner (column %).

ICT application	<40 years	40-49	50-59	60+	All
Computer	100	99	99	99	99
Internet e-mail	93	83	89	90	88
Website	63	60	63	67	63
Networked computers	53	57	51	56	54
Wireless access	19	15	13	15	15
e-commerce	8	9	7	12	9
Sample (n)	67	161	243	162	633

Source: Small enterprise research team.

report the types of innovation they had developed or introduced in the past year. Table 4 reveals that younger owners/managers tended to focus on products and processes, while the more experienced owners were slightly more concerned about supply and marketing innovations, but the differences were not significant. These are multiple responses and, although no significant tests were conducted, it can be seen that the older SMEs are still very active in introducing innovations in a range of areas. This suggests that older firms managed by older entrepreneurs may not be so technophobia with regards to ICT and other innovations as is sometimes suspected. In the final quarter of 2003, SER team surveyed SME adoption and the use of ICT. This is reported in Table 5, where it is clear that age is not an impediment to the adoption of advanced ICT.

The first and most obvious point to note is that computers are now ubiquitous and neither age nor size of the firm is a limit to adoption of ICT innovations. Indeed, the internet is seen as offering significant opportunities for improving value chain management through rapid access to relevant and timely information. ICT adoption seems to be linked to size, industry and the growth-orientation of the owners. Moving from the adoption of ICT to wider innovative activities, Table 6 shows that there are important differences with respect to educational levels.

This table contains multiple responses, so no tests of significance were conducted.

However, it is clear to see that SME owners without qualifications are less likely to innovate. Perhaps the most interesting finding is that SMEs, where the owners/managers have technical and vocational qualifications, are more likely, across the board, to innovate. These are multiple citations and there is no measure of the quality or type of innovations, so it is difficult to assess the significance of this finding, but it does indicate strongly that absorptive capacity is strongly bound with the operations and technical expertise of the firm.

Links to performance

It is important to establish whether a reported desire to grow is not just wishful thinking but does, in fact, represent a strategic objective of achieving growth. Each survey asks respondents to indicate whether sales over the past year have been up, down or remained at the same levels and, similarly, with their expectation for sales in the coming quarter. In this case, the reporting period covers two quarters which enable respondents to be classified according to whether their sales and expectations were consistently positive (high growers) through those

Table 6. Education effects on innovation activities in 2003 (column %).

Innovation	Degree	Professional	Technical/vocational	School	None	All
Products/services	27	32	31	26	28	28
Processes	25	25	30	22	26	25
Supply management	13	11	15	11	10	12
Distribution/marketing	22	24	25	16	15	21
No innovation	46	46	39	42	49	45
Sample (n)	259	159	79	122	73	692
%	37	25	11	19	11	100

Source: Small enterprise research team.

through those who were consistently negative (strugglers), with three intermediate categories. The growth-orientation variable is split between the growth-oriented who are keen to grow (some to a target and others indefinitely), those who have a strategy to sell or merge their firm and the non-growers who report having no strategy or a desire to reduce the size of the firm.

It is clear that growth intention is related to performance. Some 45% of growth-oriented SME owners reported consistent or variable growth compared with just 27% of the non-growth strategy firms. Perhaps more significantly, nearly three-quarters of SMEs without growth objectives are weak, struggling or static (Table 6).

In this context, it seems reasonable to treat growth-orientation as a proxy for the entrepreneur, even though in relation to adoption of ICT innovations, there were no significant differences with respect to growth-orientation. In relation to their own creation and adaptation of innovations, respondents were asked if they had developed significant new products or services, introduced new significant process or made significant changes to sourcing supplies, marketing, distribution and so on. They were also asked to state if they had not made any particular innovations in the past year. Based on a frequency count of the number of different areas of innovation they mentioned, respondents were classified into two categories (single activity and multi-activity innovators), which were added to the self-declared non-innovators (46% of the sample) to form an innovation propensity variable. When cross-tabulated against the measure of growth variable in Table 6, multi-activity innovators were significantly more likely to be consistent growers than the single-activity innovators who in turn were more likely to be consistent growers than non-innovators; and at the opposite end, non-innovators were significantly more likely to have weak or struggling firms.

The significant links between innovation and growth strategy are very clear as it is conversely. Lack of innovation in a firm is clearly linked to its lack of a growth

strategy, though the causal directions are perhaps not quite so clear. For instance, most innovative firms with higher educational levels were found, more likely, to have invested in their firms over the past year, but also a smaller segment were more likely to have cut the investments (though on balance, innovators were more likely than non-innovative firms to have made such investment. Not all these investments will be a formal R and D, but the higher level of activity reflects a more planned and strategic approach to innovation. This is another indication of the links between entrepreneurial strategy and the internal absorptive capacity of SMEs. Conversely, lack of strategy suggests that the structures and culture to support innovation will also be absent though it is also likely in some growth-oriented SMEs that the lack of innovative capacity in the firm may mean that high growth objectives are, in fact, unrealistic.

Finally, there were few significant links between sources of knowledge and performance, though graduate SME owners were slightly more likely to have increased both investment and employment, while maintaining sales. They are also more likely to be planning to invest over the coming year. However, in relation to future investment, it is the SME owners with technical and vocational qualifications that are more likely to be planning to invest. This reflects the findings in Tables 1, 2 and 6 and, with respect to the development of absorptive capacity, it is interesting to note that SMEs planning to invest in the coming year are much more likely to provide training and development to their staff and managers.

DISCUSSION AND CONCLUSION

With respect to the two research questions that are previously posed, the findings from recent SER team surveys clearly indicate, first, that there are significant differences between SMEs with respect to absorptive capacity as indicated by levels of education, staff

development, growth orientation and propensity to innovate, aligned with the findings of Heeley (1997), Jones and Carven (2001) and Griffith et al. (2003). In relation to the second question, limitations of the data which were collected for the purpose of providing simple performance indicators restricted the level of analysis. Nevertheless, it was clear that SMEs which display the attributes of high absorptive capacity firms, such as higher levels of education, staff development and propensity to innovate, also displayed stronger growth orientation and performance. In this respect, they are entrepreneurial firms. Heeley (1997) and Cohen and Levinthal (1990) have reported the same results.

The findings presented here strongly indicate that the owners' strategic objectives, and the consequent culture created within the small firm, are crucial. If they are directed towards achieving sustainable growth in sales and profits, then the development and use of innovation will follow from the drive to compete successfully with other similar firms. Schumpeter saw this desire to win as the main driver of innovation just as he suggested that most entrepreneurs will eventually reach a point of personal and material satisfaction when they turn to other goals and become managers not entrepreneurs.

The findings provided strong evidence that the desire to grow does lead to actual growth and that the tendency towards growth-aversion among older SME owners does affect both growth and innovation. However, this seems to be more of a problem among SMEs owners/managers with low levels of formal education. Slightly, larger-small firms, that is, those that are more likely to have developed sufficient organizational complexity to exchange of knowledge, appear to remain encourage the entrepreneurial. As such, management and technical competences can be learnt, developed and sustained.

Therefore, the Schumpeterian life-cycle need not to have the pattern of development for high absorptive capacity firms, particularly those where the levels of organizational competence and knowledge are not confined to that of the owner/manager, but include other workers and managers. If this is so, the innovative challenge to policy-makers is two-fold: (1) new ways of rekindling the enthusiasm of SME owners for the ongoing development and (2) new ways of providing the management, technical and work knowledge and skills that are relatively easy to access by busy managers and key workers.

These are not new challenges. Thus, the links between innovation and the adoption of ICT, the role that ICT is already playing in improving the speed and access to new knowledge and the clearly important effects of technical education on absorptive capacity all suggest that the route may lie in improving the technical skills'

base through e-learning and computer-based training for those disciplines and skills that are more amenable to this mode of learning.

This is likely to be a more productive use of e-learning rather than attempting to impart many of the social skills of management. Thus, a more creative approach to vocational and technical education rather than, or in addition to, higher education may offer more scope for the development of vibrant SMEs that are more open to the adoption and adaptation of new technical or process knowledge sourced from external research and development. Currently, technical and vocational education is the "Cinderella" of the British education system.

A report by ERI on the learning skills development agency (Gray, 2004), confirmed that further education colleges are not high up the list of options considered by SMEs when they seek training and development. However, there was one notable exception, which was, the firms founded by owners with technical skills acquired through vocational education (the same firms that the findings in this article have identified as having the highest levels of growth-orientation and propensity for innovation).

These were also the firms that valued technical and vocational qualifications and knowledge in their workforce. This suggests that policy-makers need to re-appraise the role of technical and vocational education not only at all levels in the educational system (in fact, calls are already becoming increasingly strident in this direction), but also with respect to the development of absorptive capacity in SMEs to encourage more entrepreneurial identification and exploitation of business opportunities in our changing economies.

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