

SUSTAINABLE DEVELOPMENT OF CONSTRUCTION SMALL AND MEDIUM ENTERPRISES (SMEs): IT IMPEDIMENTS FOCUS

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SUMMARY

Construction Small and Medium Enterprises (SMEs) face numerous impediments preventing their sustainable growth and development. These impediments include: operational factors; financial constraints; limited marketing and human resource management expertise; limited strategic planning; and ineffective Information Technology (IT) implementation. These factors are all contributing to the stagnated growth of these smaller, mostly privately owned companies. In an attempt to enhance the growth opportunities of SMEs, this paper firstly presents a conceptual framework incorporating the above-mentioned impediments. Secondly, the paper hones in on the IT implementation impediments in order to target the IT-specific barriers facing SMEs. Finally, the paper proposes some possible coping strategies to ensure more effective implementation of IT in SMEs.

INTRODUCTION

Research has indicated that the economic activity of small firms has increased substantially in the past twenty years (Hughes 1997). The employment growth rate has also been greater in small firms than large organisations offering further evidence of the importance of the small firm sector (Enterprise in Europe 1994). Small firms have offered lessons to large organisations in terms of surviving within a volatile environment, and provided a focus for economic and management enquiry (Hughes 1997). A paradox however exists in many sectors. The theory essentially focuses on large organisations and their potential for development and employment, although the significance of such firms has receded. Some theory fails to offer a clear picture of an economy that actually possesses a structure of small firms that are responsive to change, are a major source of innovation and are important job creators (Barrow 1993).

The construction SMEs and the industry as a whole has been criticized by many with regard to its adversarial nature, the take up of new technologies and processes and issues associated with organisational management (Miller et al 2002). Historically, large construction firms have taken remedial action to negate the effects of declining profits and economic recession. One strategic option available to the large firm is to retrench back into core business areas and organisations. Retrenchment and disinvestment strategies enable larger diversified firms to disregard peripheral business activity and instead concentrate on areas in which they enjoy distinct competencies or superior competitive advantage. Retrenchment strategies and the emergence of the small subcontracting firm suggest that there is an implicit interdependent relationship between the small and large firm. Interdependence implies that both parties require cooperation to ensure the success of a project and secure customer satisfaction. Harmonisation however, can often prove to be difficult. The very fact that small and large firms are fundamentally different leads to as many problems as it does opportunities for both parties. The Cambridge Study (1992) quoted in Storey, (1994) and Stokes, (1995) suggests that small firms generally are not adept at marketing, financial control, or management, and often possess little motivation in terms of accelerating the firm's innovative capacity. These factors can be construed as contrary to the atypical large organisation.

The work of O'Farrell and Hitchins (1988) offers the argument that many craftsmen-entrepreneurs wish to continue to exercise their own trade skills, and may be reluctant or unable to become more heavily involved in the administration, management and paperwork required by technological complexity. Woo et al (1989) identified that craftspeople and independent entrepreneurs had less experience in marketing and sales. These are areas that current theoretical thinking consider to be imperative if small firms are to succeed within a global market. Many theorists within the small



business sector have identified areas that can offer competitive advantage and arguably, the mechanisms that will allow smaller firms to work in harmony with larger organisations. It has been recognized within the small business arena that the motivation of the owner manager is the key criteria to the attainment of competitive advantage within a firm's environment (Gartner 1988). The literature within this area suggests that the personalities of owner/managers in terms of values and goals are indeed indistinguishable from the goals of their businesses (Kotey and Meredith 1997, Jennings and Beaver 1997). Research conducted by Meredith and Kotey (1997) of 224 small businesses indicated that personal values, business strategies and firm performance were empirically related. This research is important in terms of the small construction firms ability to adopt new technologies is related to the values and goals of the owner/manager. In a study by Wyncarczyk et al (1993) of 150 small businesses, the management and marketing abilities of owner/managers has been shown to have a positive effect upon the financial success of small firms.

Strategically speaking, IT has the potential to change the landscape of the SMEs. These firms, however, seems to make slow progress towards capitalising on the opportunities IT offers, to gain competitive advantage and enhance performance. Reasons for the slow uptake of IT have been investigated and are well documented (Betts, 1999). They include the very nature of how the industry operates one-off projects, industry fragmentation, lack of client leadership, low level of technology awareness and training, required up-front investment, on-going maintenance costs and resistance to change.

In an attempt to improve the outlook of SMEs this paper examines the prominent impediments preventing the long-term sustainability and growth of these firms (see Figure 1). The following sections of the paper briefly describe these impediments individually. However, it should be noted here that the primary focus of this paper is on the IT implementation impediments. Also, coping strategies are suggested to overcome these impediments in the latter part of the paper.

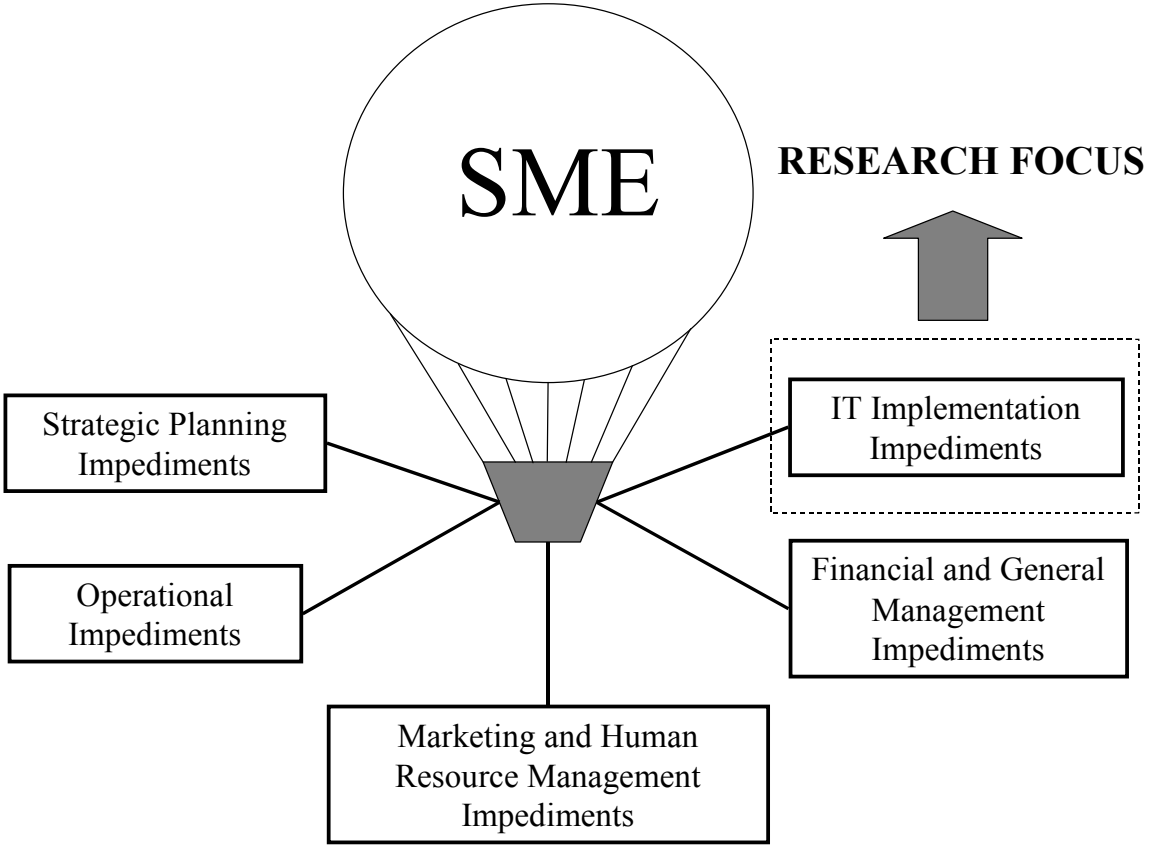


Figure 1 Conceptual framework – impediments faced by SMEs

OPERATIONAL IMPEDIMENTS

In a study by Wynarczyk et al (1993) of 150 small businesses, the management and marketing abilities of owner-managers has been shown to have a positive effect upon the financial success of small firms. Kale and Arditì (1998) add that the lack of financial resources and the lack of financial support from creditors compound the problems faced by small firms. It is therefore normal for small firms to be particularly inept in terms of adopting effective marketing and management strategies (Storey 1994). Managerial weaknesses faced by owner-managers of small firms can impact upon survival. Many small firms fail to effectively manage markets, finance, employees and prices that often result in the firm folding. Small firms often refuse to acknowledge that the environment in which they operate is constantly changing and impacting upon the firm (Kale and Arditì 1998). Construction Industry reports such as Latham (1994) and Egan (1998) highlight the need for the industry to embrace contemporary technologies and processes. Very few publications however investigate the level of technological and process inadequacy of SMEs.

FINANCIAL AND GENERAL MANAGEMENT IMPEDIMENTS

The (UK) Rennes survey (Hankinson et al 1997) argues that owner managers fail to address weaknesses in financial management and spend less than five hours per week extracting data from financial accounts. Storey (1994) offers that many small firms fail to keep adequate financial records and are often unaware of current financial situations. Owner managers also admitted to spending the same amount of time analysing the firms' strategic aims and objectives both in the short and long term. Ghosh et al (1993) report that the satisfaction of customer requirements, service, a good management team and good networks were the chief success factors of over 100 manufacturing firms. This can be compared to Smyth (1999) who argues that switching costs are high for contractors and clients if the product delivered is complex, within a complicated relationship. As payment is regarded as an important variable within contractual relationships, a tenuous link can be made between payment and the type of service provided by all parties within the relationship. Smyth (1999) argues that costs can be reduced through the supply chain if the cost of exit from the relationship is high. He fails however, to attach significance to the contractor SME relationship in that financial benefits can be achieved if both parties can understand and accept interdependence.

MARKETING AND HUMAN RESOURCE MANAGEMENT IMPEDIMENTS

Developments in research indicate that the primary problems faced by small firms are sales/marketing, human resource and management planning (Hueng and Brown 1999). It is the owner-manager firms employing less than 50 employees that take responsibility for much of the Human Resource Management (HRM) and employee relations (MacMahon and Murphy 1999). All firms require a committed, well-motivated skilled workforce if they are to survive within a global environment (Thompson 1999). Whilst large firms are downsizing and consequently losing employees, small firms are facing increasing pressure to retain and train employees (Hall 1995). Human resource issues in large firms differ from small firms but recent research has failed to offer any valid explanations. Practices that are suitable within a large firm environment are not necessarily practicable or beneficial in a small firm environment. There is an absence of data in regard to human resource practices in small businesses (Wager 1998). The study of 1000 small firms conducted by Wager indicated that practices such as employee training and development were not in operation within small firms with less than 25 employees. It was found that firm size was positively associated with the adoption of human resource practices.

It is interesting to note that many firms have very little understanding of the marketing concept and view it merely as the promotion or advertisement of a product or service (Hueng and Brown 1999). Within small subcontracting construction firms the marketing efforts of owner-managers are usually ad hoc and are often the only effort made from within the firm (Carter and Dunne 1992). The Rennes survey included construction firms as one of five sectors utilised within the study. Owner managers in general within the study view their management skills, technical ability and leadership as above average. It is therefore contended that the success or failure of the small business is dependent upon the decision-making ability and interpretation of environmental intelligence of the owner-manager (Stokes 2000). It is widely accepted that the decisions of owner-managers can be rarely overridden (Jennings and Beaver 1997). It is therefore submitted that research should address the motivations, aspirations and values of owner managers.

STRATEGIC PLANNING IMPEDIMENTS

In the construction industry the level of planning in small firms is critically low (Hall 1995). This is not to say that planning can categorically increase performance and sales turnover. Weston (1996) argues that formal planning can undermine the creative thinking of owner managers of small firms. Hall (1994) presents that planning in small construction firms and general increases in management expertise may indeed be beneficial. Market segmentation, pricing strategies and environmental analyses are strategies that can increase business awareness and increase profitability.

It is considered necessary to account for all these factors affecting the survival and development of SMEs, as small firms are heterogeneous in nature. It is evident from the literature that small firms are complex and multi-faceted. Westhead and Birley (1995) offer that progress within the field of Entrepreneurship can no longer assume that there is one truth. The understanding of SMEs is no different in that the owner managers involved are diverse individuals with different levels of problems and opportunities. For development to succeed we must understand owner managers and the firms ability to develop.

INFORMATION TECHNOLOGY IMPLEMENTATION IMPEDIMENTS

Effective IT implementation in SMEs is essential to improve the productivity. A study by Love et al (1996) identified problems and impediments to the implementation of IT. The most significant problems were the *lack of system knowledge*, with 68% of contractors interviewed perceiving this as a problem area, and *lack of training associated with the implementation*, with 62% identifying this as a problem. The lack of knowledge and ignorance of the potential benefits or IT applications was found to extend to contractor's existing systems, with more than 50% of contractors unaware of the capabilities of their existing highly specialised software. Often, tasks that could be handled by existing systems were externally contracted, as the organisation was unaware that their system was capable of the task. The lack of knowledge was also identified as one of the main reasons why management had little interest in a commitment to the Internet, e-mail and advanced applications such as knowledge-based expert systems and simulation.

Marsh and Finch (1998) conducted a survey of attitudes towards the application of data capture technologies among UK construction firms. The major impediments included a *general lack of awareness about the technologies*, coupled with *uncertainty about how to identify and measure potential benefits*. The Computer Integrated Construction Association, CICA (1993), described similar concerns among firms relating to the *evaluation of other forms of IT*, including EDI, electronic trading and design systems. The problem of identifying benefits of IT investments is not unique to the construction industry. It is a problem experienced in almost all types of business sectors and organisations. However, the problem is more acute in the construction industry as a result of the *industry's structure, fragmented supply chain and under capitalisation* (Andreson et al 2000). Small and medium sized enterprises are particularly sensitive to *cyclical variations in demand, frequency seeking to justify investments in IT within the time constraints of a single project or contract* (Marsh and Flanagan, 2000).

Tucker and Mohamed (1996) have also identified several impediments to IT implementation in construction firms, including:

- *Reluctance*: Due to senior managers who, through the lack of system knowledge/understanding and being convinced of the immediate gains that could be achieved from IT applications.
- *Resources*: Both financial and personnel, with organisations under heavy competition, reluctant to invest in technology and unable to provide time to change operations and train staff.
- *Training*: Lack of time for training and changing operations is taken into account when considering IT implementation.
- *Change*: Any changes to work processes are disruptive to productivity, especially during the introduction phase of and more so if the introduction is not known in advance.
- *Tradition*: People, no matter how dedicated to the new tools, usually have a tendency towards doing things the way they are used to.

The above-mentioned impediments and others have been categorised into specific groups, their causes and associated references obtained from the extensive literature review (see Table 1).

Impediments	Causes	References
Traditional approaches encouraged	<ul style="list-style-type: none"> • Large majority of senior employees come from pre-information technology era • Limited exposure to innovative technology • Fear by senior management to employ people with IT skills 	Tucker and Mohamed (1996); DIST (1998); Brandon, 2000; Love et al (2001)
Resistance to change	<ul style="list-style-type: none"> • Large majority of senior employees come from pre-information technology era • Limited exposure to innovative technology • Industry culture 	Tucker and Mohamed (1996); DIST (1998)
Limited awareness of available IT applications, tools and their evaluation	<ul style="list-style-type: none"> • Resistance to IT applications and tools • Poor training provided to employees on full potential of IT applications and tools 	Love et al (1996); Marsh and Finch (1998); DIST 1998
Limited resources (financial, personnel, training)	<ul style="list-style-type: none"> • Competitive tendering process inherent in industry • Limited capital for IT training and support in organisations • Industry unable to attract and retain good IT personnel 	Tucker and Mohamed (1996); DIST (1998); Love et al. (2001); Mak (2001)
Lack of strategic planning and/or incentives for successful IT diffusion	<ul style="list-style-type: none"> • Government and private enterprises providing limited incentive for innovative IT employment • Incentive typically based on short-term financial success • Limited incentive for IT champions 	Baxendale (1999)
Reluctance by senior management to adopt IT	<ul style="list-style-type: none"> • Large majority of senior management come from pre-information technology era • Limited exposure to innovative technology 	Tucker and Mohamed (1996)

Table 1 IT implementation impediments

DEVELOPING COPING STRATEGIES

To overcome potential IT implementation impediments, Tucker and Mohamed (1996) recommend the following four coping strategies could have a substantial effect on the success of required IT implementation:

- *Purpose*: To be well defined, in advance, for selecting and investing in IT tools and agreed upon by both senior management and users.
- *People*: Construction professionals are known for their lack of enthusiasm towards advanced computer applications, unwillingness to change existing work responsibilities and lack of system knowledge by executives. Support and involvement of senior management is needed, and translated to other employees through a strategic plan of implementation.
- *Plan*: A strategic, practical plan of implementation has to be drawn out prior to embarking on IT implementation. Both users and developers of the new system need to be involved in developing such a plan ensuring that it not only confined to the implementation strategy, but should also address performance indicators and support for users.
- *Progress*: Needs to be measured before and after implementation of IT to evaluate the perceived added value. Regular reviews are to be held and findings are to be shared amongst users to identify problems or areas for improvement.

Mak (2001) studied the management of information for construction projects. Mak's research identified the following seven coping strategies for the successful implementation of an Internet-based information system on construction projects:

- *Planning*: including infrastructural and architectural planning;
- *Training*: develop and deliver training and perhaps re-training programs;
- *Participating*: through direct and indirect employees, business partners;
- *Leadership*: the business or the end user should take charge in the specifications while the IT section should provide support to fulfil the user requirements, and employ IT experts with experience in the construction industries as consultants;
- *Organic growth*: start small teams and let the system grow gradually in terms of functionality;
- *Groups*: establishing and participating in news groups, e-mail mailing lists to share experience and to foster concerted effort to develop applications using open standards; and
- *Staff development*: by such means as teaching companies and other short courses.

Miozzo et al (1998) examined a series of process-based blockers (impediments), eliminators and associated workplans (coping strategies) for effective technology diffusion in construction. Their suggested workplans give an indication of critical success factors required to facilitate the flow of information in construction processes. These include:

- The *transfer of process-based methods* applied in *other industries* to construction;
- The use of *multi-disciplinary and cross-industry workshops* to identify economic technological problems and opportunities in construction;
- The implementation of *benchmarking activities* and identification and dissemination of best practice in the industry and other industries;
- The implementation of *pilot developments and their follow-up*; and
- The introduction of *organisational changes*.

The above-mentioned coping strategies and others have been categorised in the same manner as IT implementation impediments (see Table 2).

LINKING IMPEDIMENTS TO COPING STRATEGIES

IT implementation impediments and the coping strategies that can mitigate their effects have been conceptually linked in Figure 2 to better describe the relationship between them. Linking the individual coping strategies to impediments is essential to understand the contribution of these factors to the efficient and effective IT implementation.

Coping Strategy	Benefits	References
Senior management commitment to the strategic use of IT	<ul style="list-style-type: none"> • Sufficient resource expenditure on IT initiatives • Efficient management of IT resources 	Teo et al. (1997); Shen and Fong (1999)
Strategic planning	<ul style="list-style-type: none"> • Improved internal coordination • Improved competitive position • Greater ability to meet changes in the industry 	Tucker and Mohamed (1996); Teo et al. (1997); Mak (2001)
Evaluation of IT performance	<ul style="list-style-type: none"> • Better understanding of the value-adding benefits of implemented IT • Continual monitoring of the performance of IT investments 	Tucker et al. (2001); Tucker and Mohamed (1996)
Resource development and training	<ul style="list-style-type: none"> • Higher utilisation of IT applications and tools • More effective use of IT 	Boyd and Paulson (1995); Mak (2001)
Alignment of business goals with IT goals	<ul style="list-style-type: none"> • Sound technology path and policies • Ensuring IT investments assist meeting organisational objectives 	Boyd and Paulson (1995)
Awareness of the role of IT and it's benefits	<ul style="list-style-type: none"> • Higher utilisation of implemented IT applications and tools • Reduced resistance to IT-enabled re-engineering processes 	Boyd and Paulson (1995)

Table 2 Proposed coping strategies

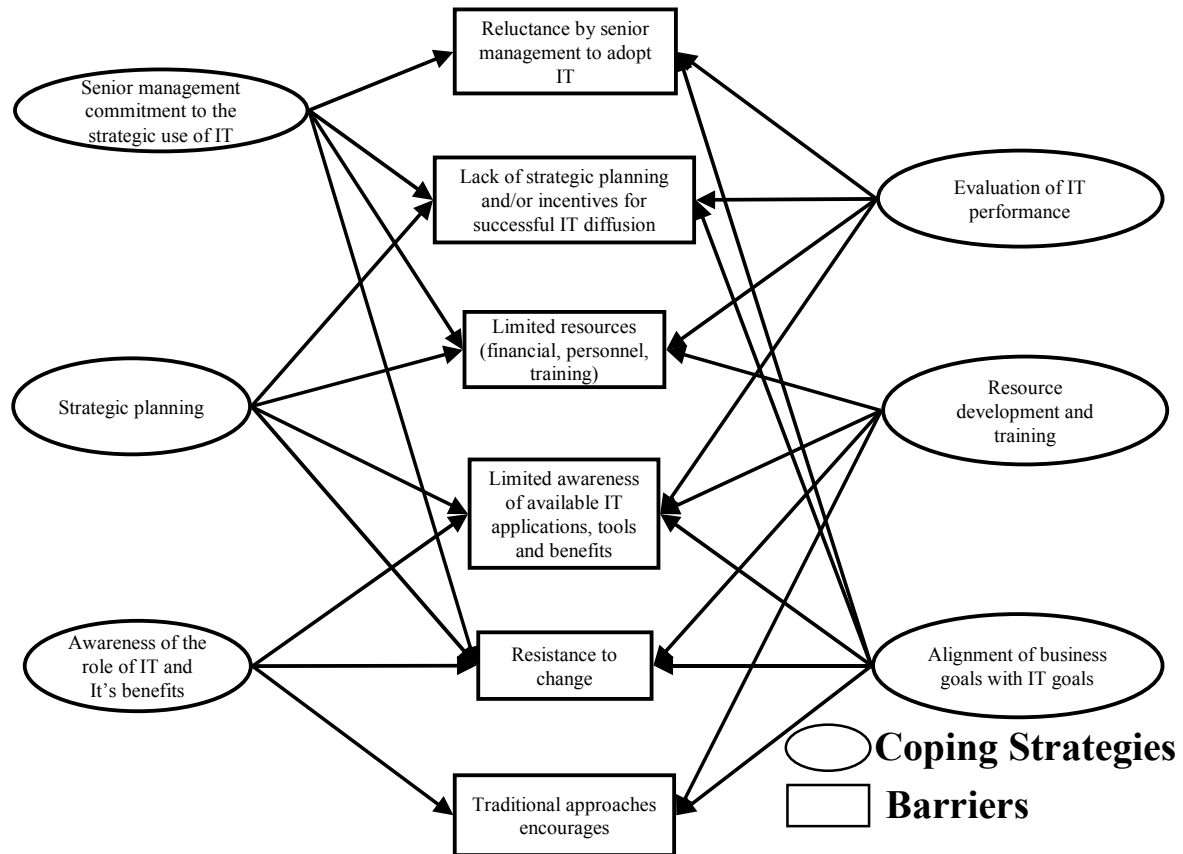


Figure 2 Linking impediments to coping strategies

FUTURE WORK

The research presented in this paper focuses on one of the five categories of impediments facing SMEs, namely, IT implementation impediments. A concise list of barriers is presented for this category and a number of coping strategies to mitigate their effects are introduced. Future work proposes to adopt a similar approach to that detailed for the IT implementation impediments, for the other categories with the aim to link specific impediments to coping strategies. Once this has been achieved for the five categories, the authors wish to gauge the perceptions of SMEs through a questionnaire survey approach, to quantify the level of significance of individual impediments and the most 'practical' and 'effective' coping strategies to overcome them.

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