

24 SMEs AND THE GAINS FROM IS: FROM COST REDUCTION TO VALUE ADDED

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Abstract

Based on multiple case research, this paper develops a model of IS use in small and medium-sized enterprises (SMEs). The model reflects the relative dominance of SME customers on one hand and the strategic focus of the organization on the other. The paper first investigates the ways in which IS may add value to organizations. Then it outlines the use of IS in SMEs. This is followed by an analysis of competitiveness in small businesses. Fourth, it describes the research method employed during the case research. Fifth, it presents an analytical model and analyzes the database of 26 cases. Four cases are presented to illustrate the differing uses of IS. In concluding, the implications for theory and practice are outlined.

Introduction

Most organizations use information systems (IS) in some way. IS may be used to lower costs of production, coordination, and transactions, or may be employed to add value to the product, process, or service. In general, it is large organizations which have reaped the early gains from IS, although the well-publicized failures offer a note of caution. Many of these gains now come from value-adding rather than simple cost reduction. As IS costs fall and their use becomes more commonplace, small and medium-sized enterprises (SMEs) have begun to exploit their potential. Much of this exploitation mimics the early use of IS in large organizations: cost reduction. However, there is evidence that SMEs use IS to coordinate activities and also to add value via collaboration. This paper argues that SMEs may further use IS for innovation.

Based on multiple case research, this paper develops a model of IS use in SMEs. The model suggests that the extent of customer dominance and the strategic focus of the organization can be a useful way through which to understand the activities of SMEs. The paper first investigates the ways in which IS may add value to organizations. Then it contrasts this with the use of IS in SMEs. This is followed by an analysis of competitive issues facing small businesses. Next, the paper outlines the research method employed during the case research and proposes an analytical model combining customer dominance and strategic focus. Four cases are outlined to illustrate the differing uses of IS. Last, the discussion reflects on the model and the case outcomes, linking these to the MIT90's framework (Scott Morton 1991). Conclusions are presented and a research agenda is suggested.

Getting Value From IS

Information systems have long been used by organizations to automate transaction processes. However, as Zuboff (1988) recognizes, the information held on organizational systems can provide greater value than merely for managing operational transactions. The earlier competitive advantage debate over the use of information to enable organizations to market new products or provide new services contains similar themes (Porter and Millar 1985).

Many organizations now view investment in information not as means to cost reduction but as a way of adding value. To achieve this, they need an information systems strategy that is an integral part of business strategy (Earl 1989; Galliers 1987). However, it is clear that for many organizations IS strategy is reactive to business strategy (Galliers 1991) and possible advantages of using IS competitively are missed.

Further, the majority of IS research is of large organizations. This paper explores whether SMEs have the same opportunities for using IS to add value as their larger counterparts. One SME case demonstrates that information systems and technology can play a critical role in adding value (Yetton, Johnston and Craig(1994) . However, another concludes that the tendency in manufacturing SMEs is to view investment in IS as a cost (Levy and Powell 1997).

SMEs and IS

The introduction of information systems into SMEs, like its early introduction into large organizations, tends to be fragmented, based around operational support and transaction processing (Blili and Raymond 1993). In contrast, information systems for supporting management decisions are less common. Cragg and King (1992) find that management IS provide no benefits to SMEs in terms of performance. Further, they argue that firms with more sophisticated IS tend to perform worse than those with more limited systems. They maintain that this is primarily due to SMEs' limited information systems knowledge and skills which precludes them from taking advantage of strategic information. Julien and Raymond (1994) concur.

However, Naylor and Williams (1994) suggest that, while planned efficiency benefits do not materialize, unplanned benefits from analysis of information do arise. Simple decision support systems, such as spreadsheets, are used by SMEs to provide strategic financial information which leads Naylor and Williams to suggest that IS are used for "more complex procedures than has previously been reported." Their research highlights that once managers use available information to consider strategic issues, benefits accrue and SMEs are more inclined to invest further in IS.

In addition, some recent start-up SMEs owe their existence to information systems and technology. These firms are innovative and invest in IS to provide products and services which are only possible because of technological advances. IS investment for these firms is a priority, with higher initial capital investment (Rothwell and Beesley 1989). However, there is evidence that investment in information systems declines over time for these SMEs as resources become scarce once the business is running (Rothwell and Beesley 1989).

Finally, Hashmi and Cuddy (1990) point out that one of the problems for SMEs is their propensity to invest incrementally in information systems rather than in a planned fashion. While Hashmi and Cuddy identify this as an inhibitor to the effective use of IS, Yetton, Johnston and Craig suggest that where incremental investment is tied in with organizational learning it can be a means of increasing competitiveness. Hagmann and McCahon (1993) find few SMEs plan for the systems they purchase and most planning is done for transaction processing systems. That management and strategic information systems are purchased, but not planned, is a concern. The main focus of IS planning is to improve the efficiency of operations (particularly management support, office automation, and forecasting) and there is little concern with competitiveness. They find there is also no link between levels of computerization and IS planning, which echoes Cragg and King's work. The nature of SMEs (their organic structures, owners' attitude, and resource poverty) and their limited knowledge and experience with IS may influence their ability to plan effectively (Blili and Raymond 1993). Additionally, owners only consider IS planning if they can see that it will enable them to be innovative and directive of the business.

Thus, current research into IS use in SMEs gives mixed messages. On one hand, many SMEs have transaction processing systems used in quite sophisticated ways, which are oriented toward strategic management information. On the other, investment in management information systems does not bring the anticipated benefits, although unplanned benefits may be realized. This is similar to the findings by Farbey, Land and Targett (1992) for large organizations.

SMEs and Competitiveness

A key inhibitor or enabler of IS use in SMEs is their competitiveness. SMEs are driven primarily by the needs of their customers. In most cases, customer power is high (Porter 1980). Reid and Jacobsen (1988) find that many SMEs are dependent upon customers who purchase large quantities and these customers are able to influence price. Storey and Cressy (1995) also show that the competitive environment in which SMEs operates increases the risk of failure. They suggest that market uncertainty is high as SMEs tend to have small market shares, a few major customers, and are, hence, less able to influence price. For SMEs, customer numbers and customer power tend to be inversely proportional: small numbers of customers with considerable power dominate SMEs.

Reid and Jacobsen find that in the automotive sector the influence of the customer extends to ensuring that the SME can demonstrate quality of process and product. This is usually achieved through the introduction of formal, computer-based performance monitoring systems. Additionally, information to do with operations (i.e., orders and accounts) and design are often expected to be transmitted electronically (Levy et al. 1997), which may bring collaborative advantage.

Successful SMEs cultivate their customers closely, monitoring individual requirements to keep their loyalty (Reid and Jacobsen 1988). This is both at a social level and at an operational one. Not only are major customers courted, but so are smaller ones in order to maintain loyalty. Advising customers of new products or services is seen as important. SMEs are valued because of their ability to respond to customers' requirements quickly as they tend to have short production runs. Lefebvre and Lefebvre (1993) find that there is a link between the innovative efforts of an SME and its competitive position. Information systems may be a mechanism by which SMEs are able to respond to the market effectively. IS can play a part in responding to customers' requirements by enabling information to be transmitted directly. For example, EDI is used for production planning, while designs can be integrated through the application of computer aided design linked to the customers' information systems (Levy et al. 1997). This paper shows that IS strategies in SMEs are a function of their competitive context, that is defined by their strategic focus (cost versus value added) and degree of customer dominance.

Background to the Case Research

Case research has a long tradition in IS research as a method of providing rich, contextual data. This research uses case studies undertaken between 1995 and 1997 on 25 SMEs in the West Midlands of the United Kingdom in order to assess the role of IS in the organization. It also includes one Australian case used to illustrate innovation. Analysis of the case material is based on the work of Levy et al. on the transferability of information systems planning frameworks from large organizations to the SME sector. Each case was conducted over a one week period during which the managing director (MD), the senior management team, and other employees took part in a number of semistructured interviews each lasting for between one and two hours. Background and market material and the outcomes of the interviews were analyzed and reported back to the participants to provoke further discussion. The product of this process is a "requisite" model of the SME, the form of which is sufficient to satisfy the problem situation (Phillips 1984).

Analytical Framework

As identified, customer power is a critical determinant of the way SMEs use IS. Similarly, the purposes for which IS may be used range from cost reduction to value added. These two dimensions define the strategic context, creating four competitive scenarios for SMEs: efficiency, coordination, collaboration and innovation (see Figure 1). The key characteristics of each quadrant are defined below.

Customer Dominance	Low	Coordination	Innovation
	High	Efficiency	Collaboration
		Cost	Value Added
		Strategic Focus	

Figure 1. Four Competitive Scenarios for SMEs

Efficiency Quadrant

The focus of IS use in the *efficiency* quadrant is for control of the business, primarily financial control. There is no integration with business strategy and, indeed, there is no recognition of the role of information in supporting the achievement of business strategy. The information systems are concerned with improving the efficiency of internal processes within the SME, such as word processing, spreadsheets used for accounting, or accounting packages. Information systems are, consequently, viewed as a cost to the business. The situation typically occurs where there is high customer dominance. This may be because the business is starting up or because it is the nature of the industry.

Coordination Quadrant

In addition to the systems required to keep costs down in the efficiency quadrant, in the *coordination* quadrant the main additional use of IS is in improving customer care due to the larger customer base. Databases are used primarily to manage customers across departments. Hence, communication between departments is seen as a role for IS. The objective of the information systems is to improve the effectiveness of business processes but the focus continues to be internal. There is only limited integration of IS with business strategy. Again, IS are viewed as a cost to the business, a necessity as manual systems cannot cope as the customer numbers increase.

Collaboration Quadrant

The third grouping is the *collaboration* quadrant. Here there is an increase in the sophistication of the technology used. SMEs in this quadrant need to communicate and exchange information with their customers in a cost efficient manner, hence the use of systems such as electronic mail and EDI. The use of IS is integrated with business strategy, particularly when dealing with major customers. Often, customers are the driving force behind the introduction of new IS.

Innovation Quadrant

The final quadrant is *innovation*—the integration of information systems with business strategy (Yetton, Johnston and Craig 1994). Here IS are an integral and tightly woven part of the business strategy of the SME. Therefore, they influence the direction of business strategy as well as react to it. For example, in the Flower and Samios case (Yetton, Johnston and Craig 1994), the introduction of IS had a major influence on the strategic direction of the business as all architectural designs are now developed in 3D on the screen. This changed both the business processes and the people skills that are required. Information from external sources is used in maintaining the company profile and marketing capability. The role of information changes to how can the company grow and learn for the future rather than maintaining current direction. The need is for systems to support a performance focused management style.

Customer Dominance	Low	<p>Coordination</p> <p>Word processing Accounting Customer databases</p>	<p>Innovation</p> <p>Word processing Accounting Customer databases E-mail, Internet MRP EDI CIM LANs</p>
	High	<p>Word processing Accounting</p> <p>Efficiency</p>	<p>Word processing Accounting MRP EDI Performance Measurement</p> <p>Collaboration</p>
		Cost Focus	Value Added
		Strategic Focus	

Figure 2. Information Systems Used by SMEs

Data Analysis

The 26 SMEs used nine different information systems ranging from word processing, which was universal, to e-mail and project management systems, which were used by two and one SMEs respectively. The authors independently allocated the systems to the four quadrants in Figure 1. There was universal agreement on the allocation for six of the systems. Two authors coded performance measurement systems as characteristic of the innovation quadrant while one coded it in both the collaboration and innovation quadrants. All three coded the use of job costing and project management systems as independent of the classification schema and, therefore, they could not be allocated to a quadrant. Figure 2 presents the resultant allocations.

Subsequently, two of the authors independently allocated the 26 SMEs to the four quadrants as a function of the level of customer dominance (high or low) and the SMEs strategic focus (cost or value added) contained within the case description. Again, there was universal agreement. The outcomes are presented in Figure 3. SMEs were also classified as a function of the IS they used as shown in Figure 2. The results are presented in Figure 4.

		Coordination	Innovation
Customer Dominance	Low	<ul style="list-style-type: none"> · University Arts Centre · Regional Travel Services · Warwick Training Brokerage · Seven Stars Printers · Coventry Events Management · Landfill Gas Extraction Co. · Coventry Training Co. 	<ul style="list-style-type: none"> · Flower and Samios
	High	<ul style="list-style-type: none"> · Garden Health Care · Tree House Health Care · Car Tubes Co. · Recycling And Training Co. · Chemical Analysis Co. · Bird Designs · Landrover Repair Co. · Family Solicitors · Electrical Accreditation Institute · Precision Tool Manufacturers · Energy Waste Management Services · Queensway Photographic Designers · Model Car Importers 	<ul style="list-style-type: none"> · Birmingham Clutches · Stratford Designers · Radio Mast Surveyors · Heath Springs · Solihull Lighting Co. · Car Paint Co.
		Efficiency	Collaboration
		Cost Focus	Value Added
		Strategic Focus	

Figure 3. Current Position of Case Study Companies

	W o r d P r o c e s s I n g	A c c o u n t I n g	C u s t o m e r C o s t I n g	J o b C o s t I n g	E D I	M R P	E - m a I l	P e r f o r m a n c e	M e a s u r e m e n t	P r o j e c t	M a n a g e m e n t	I n t e r n e t	L A N
Efficiency													
Garden Health Care	X	X											
Tree House Health Care	X	X											
Car Tubes Co.	X	X											
Recycling And Training Co.	X												
Chemical Analysis Co.	X	X											
Bird Designs	X	X											
Landrover Repair Co.	X	X	X										
Family Solicitors	X	X											
Electrical Accreditation Institute	X	X											
Precision Tool Manufacturers	X	X											
Energy Waste Management Services	X	X											
Queensway Photographic Designers	X	X											
Model Car Importers	X	X	X										
Coordination													
University Arts Centre	X	X	X										
Regional Travel Services	X	X	X										
Warwick Training Brokerage	X	X	X										
Seven Stars Printers	X	X		X									
Coventry Events Management	X	X	X										
Landfill Gas Extraction Co.	X	X	X	X									
Coventry Training Co.	X	X	X										
Collaboration													
Birmingham Clutches	X	X			X	X		X					
Stratford Designers	X	X						X					
Radio Mast Survivors	X	X						X		X			
Heath Springs	X	X			X	X		X					
Solihull Lighting Co.	X	X			X	X							
Car Paint Co.	X	X			X	X							
Innovation													
Flower and Samios	X	X	X	X	X			X	X	X	X	X	X

Figure 4. SME Systems Analysis

A joint inspection of Figures 3 and 4 reveals that 25 of the 26 SMEs are allocated to the same quadrants as defined in Figure 1. The exception is Model Car Importers, which is allocated to the efficiency quadrant on the basis of its competitive context, customer dominance, and competitive focus (Figure 3), and to the collaboration quadrant on the basis of its IS systems in use (Figure 4). Thus, with the exception of one case, there is a close fit between an SME's strategic context and its IS systems in use.

Underpinning the four-fold classification system used here is the assumption that SMEs in different competitive contexts compete differently and, therefore, follow different IS strategies. To illustrate this, four cases are briefly described below.

Efficiency

Garden Health Care is a private health care provider for the elderly. It provides a home for frail people with round-the-clock care. Additionally, the organization provides support to people living in an integrated sheltered housing development. The organization has a management team of five, all responsible for a specific activity in the home. It employs 60 staff. However, in common with many other health providers, there is high staff turnover among care workers.

The organization is owned by an accountant who emphasizes the value of efficient systems to control expenditure and monitor progress. His objectives are to provide quality care and dignity for clients, maximize financial return from the business and retain control. The key success factors for the company are to maintain high bed occupancy, use resources effectively to keep costs down, and improve quality. The owner is considering expanding the facilities, either on the current site or at other locations.

The market is competitive with a number of other homes in the vicinity and there are low barriers to entry. Customer power, in the form of the local social services department, which pay for 85% of clients, is high. Quality care and moderate pricing is demanded by the customer.

The owner has set clear targets and measures for those targets. He has set up effective control systems to monitor performance against targets on a monthly basis. There are three main business processes in the organization: delivery of health care, facilities management, and financial management. Delivery of health care is about organizing the day-to-day care of clients. This is managed by the matron, whose duties include optimizing bed utilization, staff development, and training and monitoring quality of care provision. Information on clients and staff is held manually, as is cost information on hours, budgets, and income forecast. This latter information is given to the bookkeeper to enter into the computer. Facilities management involves managing catering requirements, physical plant, gardening, and transport. Rooms are also hired out to other organizations, such as social services. The final business process is financial management. The managing director sets the annual budget with the management team. This is reviewed weekly and monthly using information from managers. The MD sees all invoices from individual managers before these are entered into the computer system. He closely monitors and keeps tight control of all expenditures and variances.

The major information systems contribution to the above focus is on improving efficiency in the organization. These are an off-the-shelf accounting system for payroll

and ledger activities; an invoicing system integrated into the accounting system; and spreadsheets used for managing various budgets. The focus of these systems is, first, tight control of the finances as a means of monitoring efficiency and, second, good communication between management. The management style is formal, but the MD tours the facilities keeping in touch with day-to-day activities.

In the future, the MD wants to expand, but not to lose control. There is little risk-taking in the business and it needs more resources if it is going to expand. The current IS are effective in a tight-knit, one site organization, but it will be difficult to maintain the current systems without the MD's active involvement. Information will have to be exchanged between sites if the vision of a new health care facility is realized. The customer base will increase, requiring improved coordination of different requirements. Additionally, more than one centre will also make it necessary to monitor stock differently and raise issues of coordination, possibly relocating the organization in terms of the model.

Coordination Case

Warwick Training Brokerage started in 1989 to offer project management consultancy and training mainly in Hong Kong and East Asia. The company has since diversified into management training, led by a demand for UK management qualifications by overseas companies. Warwick Training Brokerage coordinates and administers courses on behalf of two UK universities in several Asian regions. The company had a turnover of £0.7m in 1995 and employs 10 people in the UK. The espoused business strategy is to be the biggest provider of in-house management training by 2000. They are also planning to reduce their dependence on the two universities by developing relationships with others. The company has a large number of customers based mainly overseas. Therefore, information systems and communication technologies are an important part of the business.

Customer care has been identified as a major objective for Warwick Training Brokerage. This manifests as improved marketing as well as support for existing customers undertaking distance learning courses.

Warwick Training Brokerage is proactive toward IS, employing a manager with specific responsibilities for the systems. The system is networked so that all staff can access the three main databases: marketing, students, and corporate clients. The system has been developed using Lotus Notes by the IT personnel. E-mail is used to communicate with customers overseas. The firm has a separate PC-based accounting system while personnel and payroll operations are outsourced. They pride themselves on being informal and responsive, with all staff able to undertake all business activities. However, while the systems are designed to aid coordination of business activities, this informality leads to information not always being entered into systems and opportunities that are sometimes not followed up.

As the firm grows, there will be a move toward greater collaboration with universities providing distance learning management training. It is intended that this will change Warwick Training Brokerage's role to increase the partnership element of the relationships. It is also intended to increase the numbers of universities that Warwick Training Brokerage represents overseas.

Collaboration Case

Birmingham Clutches manufactures tube-based products for the automotive industry. They are family-owned with 285 employees and a turnover of £12m. They currently have two major customers. Birmingham Clutches has grown from a Victorian business in tube and wire bending. It is now a first tier supplier to two major motor manufacturers (i.e., they deal directly with these) and a second tier company to five others through wholesalers.

In the late 1980s, the company recognized it was losing competitiveness through creeping inefficiencies and poor management information. The company was located in several city center sites which made it difficult to run efficiently. They made two major decisions as a result of an audit report. The first was to bring in finance and production directors, where previously the company had been managed by the owner, to improve efficiency and increase turnover. Second, the company relocated to the suburbs, which enabled the whole company to be on one site.

The audit report also highlighted the need for better management information, in particular, accounting information, which was only available months after events. The company also lacked an effective stock control system. Not only were there pressures to improve internal management information systems, but, as with other firms, the major motor manufacturers insist on a quality information system that provides performance measures against which to assess production and process quality.

The company has introduced both accounting and production systems, including MRP. It has EDI links with one major manufacturer for both orders and CAD. There is no link currently to the MRP system. However, the company has introduced these systems in a reactive manner to address individual needs. There is no attempt to develop an IS strategy to look at the integration of systems. The quality information system is spreadsheet-based and not integrated with production systems. The quality system is a customer requirement to remain a preferred supplier. The information has to be re-entered manually onto spreadsheets.

The company is dependent upon its preferred supplier status for its profitability. The customer demands more integration of processes from design to final output. There is a need to improve integration in order to provide better management information to ensure that the relationship between Birmingham Clutches and its customers provides mutual benefits.

These three cases illustrate how the firms compete differently. As such, they exhibit different strengths and weaknesses which are also present in their differential use of IS. Figure 5 summarizes the strengths and weaknesses observed across the cases. The findings from an architecture case (Yetton, Johnston and Craig 1994) are used to illustrate the innovation quadrant as none of the cases above fell in that quadrant.

Innovation Case

Flower and Samios are a firm of architects in Australia. They were reasonably successful. However, they lost a major contract which they expected to win. They investigated and discovered that the winning architect used computer-aided design.

This inspired Flower and Samios to follow suit. They bought the latest software and hardware for architecture design. The learning curve was steep, but at the end they decided that their strategic direction would need to be reviewed as the future was, increasingly, being directed by the role of the information technology and systems available to them. All the architects who worked for them were required to become proficient in the use of the computers. All new employees were expected to be able to use the systems from day one. The downside was that people who could not or would not learn the system were made redundant.

The business value from IS dramatically increased as architects could reuse components from other designs. An electronic library was gradually built up which improved efficiency. Designs are shared among the architects through a local area network. The firm has been extremely successful in integrating information systems into its business strategy and is recognized as one of the leading architecture firms in Sydney and it plans to expand geographically (adapted from Yetton, Johnston and Craig 1994).

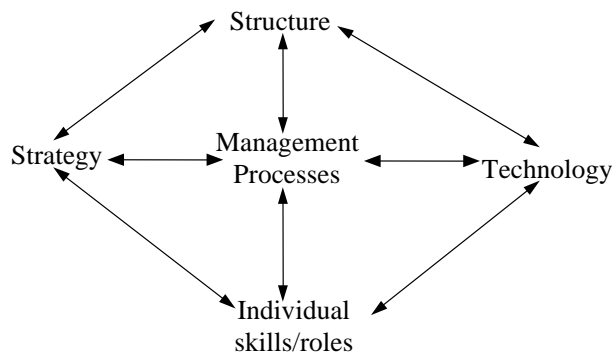
Customer Dominance	Low	<p>Coordination</p> <p><i>Strengths</i></p> <ul style="list-style-type: none"> • improved internal communication • improved customer care • increased operational effectiveness <p><i>Weaknesses</i></p> <ul style="list-style-type: none"> • internal focus • limited integration with business strategy • staff need better training 	<p>Innovation</p> <p><i>Strengths</i></p> <ul style="list-style-type: none"> • changes/changed by business strategy • external focus • changes business processes • changes employee profile <p><i>Weaknesses</i></p> <ul style="list-style-type: none"> • cost • flexibility needed • knowledgeable managing director needed
	High	<p><i>Strengths</i></p> <ul style="list-style-type: none"> • control • cost reduction • simple systems <p><i>Weaknesses</i></p> <ul style="list-style-type: none"> • operational focus • internal focus • no link with business strategy 	<p><i>Strengths</i></p> <ul style="list-style-type: none"> • integration with business strategy • improved customer relations • external focus • ultimately reduces customer power <p><i>Weaknesses</i></p> <ul style="list-style-type: none"> • customers may determine IS requirements • cost • systems flexibility
		<i>Efficiency</i>	<i>Collaboration</i>
		Cost focus	Value Added Focus
		Strategic Focus	

Figure 5. Strengths and Weaknesses of IS Strategies as a Function of Strategic Context

Discussion and Conclusions

The literature review at the beginning of this paper concluded that current research into SMEs gives mixed messages. Specifically, it noted the finding by Yetton, Johnston and Craig that, in an architecture practice, IS was the basis of a major successful transformation, while Levy and Powell concluded that manufacturing SMEs typically view IS as a cost. Here, the conclusion is that the mixed messages are the outcome of a contingent world in which IS strategies are a function of the competitive context and that a major barrier to the use of IS to support innovation is the leadership and technical knowledge of the owner and/or management team.

The MIT90s model is well-regarded and has been subject to empirical examination. Yetton, Johnston and Craig use the MIT90s model to explain the success of Flower and Samios. This paper extends the use of the model as a schema for exploring the organizational or configurational complexity associated with each of the quadrants presented in Figure 1. Figure 6 presents the MIT90s model which argues that a successful organization has a high fit among its strategy, structure, roles and skills, management processes and technology, and between that configuration and its business environment (Scott Morton 1991). It is argued that the efficiency quadrant requires only a partial internal fit while the innovation quadrant requires a full configurational fit.



**Figure 6. MIT90s Framework
(Scott Morton 1991)**

weakness of an organization in this quadrant is the absence of a link between the IS and the business strategy.

Warwick Training Brokerage is an example of the coordination quadrant. IS are networked so that all staff can access the three main databases: marketing, students, and corporate clients. This requires a more complex fit than is the case for Garden Health Care. Warwick Training Brokerage critically needs to coordinate across its departmental structures which is the justification for the network. Here the fit configuration spans management processes, technology and structures. Again, as Figure 5 shows, the lack of a link with business strategy is a weakness, but against that the improved internal communications and customer care is a major strength.

In Garden Health Care, which is an example of an efficiency focused IS strategy, the emphasis is on controlling expenditure and monitoring processes. For example, the MD sees all invoices before they are entered into the computer. In terms of the MIT90s schema, the critical fit is limited to that between management processes (accounting and stock control) and technology. At a general level, Figure 5 shows that a

The level of complexity in the configurational fit required by Birmingham Clutches in the collaborative quadrant is the same as for Warwick Training Brokerage but takes a different form. Here, the critical issue is to respond to the needs of Birmingham Clutches' major customers for production and quality control systems including, for example, EDI links for both orders and CAD with one motor manufacturer. In this quadrant, the link is not across departments but via Birmingham Clutches' strategy with its customers. The fit configuration spans strategy, management processes, and technology (see Figure 5).

Finally, while there is no case from the West Midlands SMEs in the innovation quadrant, Yetton, Johnston and Craig describe Flower and Samios as having achieved fit over the full configuration. The emphasis at Flower and Samios is on full system integration. Warwick Training Brokerage recognizes the need to move in this direction if it wishes to become more competitive and, similarly, Birmingham Clutches recognizes the need if it is to become proactive rather than simply reactive to its customer demands. The four different levels of configurational complexity are shown in Figure 7.

Conspicuously absent from the above analysis is any consideration of changes in roles and skills. As shown in the Flower and Samios case, the mastery of the IS and the technical leadership by John Flower was a critical factor in the successful transformation. The converse holds in general, namely, the introduction and exploitation of new technology is a problem for many SMEs due to management limitations. Rothwell and Beesley cite research which indicates that management has insufficient time to spend on

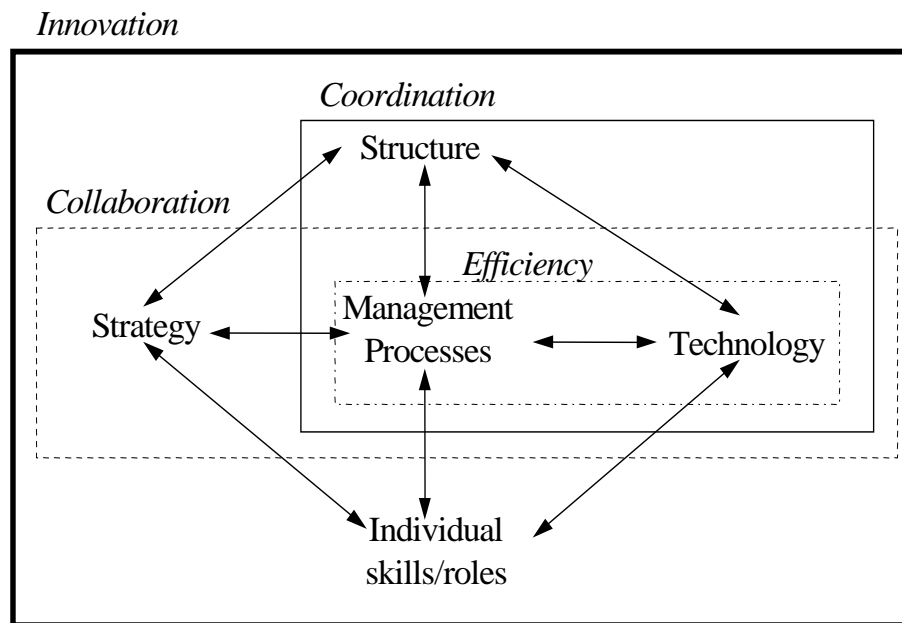


Figure 7. Understanding SME Classification Through the MIT90s Model

future business developments, and that management teams have little experience, skills, or interest in exploiting technology. There is often little attention paid to developing products or services as they are comfortable with their existing market situation. Hence, there is a tendency for SMEs to invest only in the IS necessary to carry out individual activities, particularly those which involve basic administration and transaction processing. As such, and consistent with the absence of organizations in the innovation quadrant (see Figure 3), few SMEs have the motivation and/or capacity to introduce the integrated systems needed to support IS-based innovation. Developing these capabilities in top management groups in SMEs would appear to be a critical precursor to long term success of such an innovation strategy.

This raises two questions for future research. One is whether there is an embedded stages model in the analysis presented here. Do successful organizations start in the lower left quadrant, efficiency, in Figure 2 and migrate via either coordination or collaboration to the top right quadrant, innovation? Alternatively do firms choose in which quadrant they compete and stay there? If the former, what are the critical barriers and/or enablers to IS-based successful change?

This paper has used multiple case studies to try to understand how SMEs use information systems. Case analysis has enabled the development of a model for IS use in SMEs that combines customer dominance and cost/value added focus leading to four archetypes: efficiency, coordination, collaboration, and innovation. The development of this model was discussed and examples from each quadrant analyzed. The 26 SMEs are categorized by the model leading to analysis as to the reasons for the distribution found, emphasizing the need for SMEs to manage more interacting elements as they attempt to use IS to support more complex activities. Analysis of further cases in a variety of industries not reported here suggests the 26 used in this paper are not atypical, although the research does concentrate on a single geographical region.

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