European Journal of Information Systems (2001) **10**, 25–40

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Information systems strategies in knowledge-based SMEs: the role of core competencies

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Research into the sources of competitive advantage identifies two competing views. The first concerns industry structure, and the role of information systems (IS) in enabling competitive advantage is to lower cost, build barriers to entry and tie in customers and suppliers. The second view is resource-based. This argues that competitive advantage arises from the ability to accumulate resources and capabilities that are rare, valuable, non-substitutable and difficult to imitate. This paper discusses the role of IS as firm resources and the role of such resources in small firms (SMEs). It uses as a vehicle, the identification and development of an information systems strategy (ISS) in a knowledge-based SME. The use of core competencies or capabilities, a key aspect of resources, as a basis for an ISS is contrasted with the use of a structural approach exemplified here by the value chain. Using participant observation research in a not-for-profit organisation that provides consultancy in social housing, this paper investigates these approaches. The paper concludes by identifying a number of areas for further research including the operationalisation of the core competence perspective in developing an ISS. *European Journal of Information Systems* (2001) **10,** 25–40.

Introduction

Research into the sources of competitive advantage identifies two views (Dyer & Singh, 1998). The first, exemplified by Porter (1980) concerns industry structure. The role of information systems (IS) in enabling competitive advantage in this type of world is about lower cost, building barriers to entry and tying in customers and suppliers. The second, more recent, view is resource-based. This argues that competitive advantage arises from the ability 'to accumulate resources and capabilities that are rare, valuable, non-substitutable and difficult to imitate' (Dyer & Singh, 1998, p 660). The resource-based view of the firm emphasises the resources firms need to develop to compete in the environment. Miller and Shamsie (1996) identify two forms of resources, property-based and knowledge-based. They argue that property-based resources contribute most in stable settings, while knowledge-based resources have the greatest utility in uncertain environments. Any resource of either type must be difficult to create, buy, substitute or imitate. Knowledge-based resources are difficult to imitate because they are subtle and hard to understand. Property-based resources are about control, while knowledge-based ones are enablers of adaptation. Each category of resource comes in two varieties—discrete, and systemic (or bundled) involving things such as teamwork. Miller and Shamsie state what IS researchers have shown for a long time without ever really formalising it, that 'whether or not an asset can be considered a resource depends as much on the organisational context as on the properties of the asset itself'. This reinforces the IS view that it is the use and management of IS that confer advantage, not their mere existence.

While the resource-based view of the firm has substantial theoretical support, it has not been empirically tested to any great extent (Miller & Shamsie, 1996). The little testing that has occurred is in large US firms. While the resource-based view in the context of small and medium sized enterprises (SMEs) has been recently explored, for example by Rangone (1999) with respect to strategic planning, the role of IS strategy is unexplored.

This paper takes the first step towards filling this void. It discusses the role of IS as firm resources and the role of such resources in SMEs. It uses as a vehicle the identification and development of an IS strategy (ISS) in a knowledge-based SME. This type of firm should have systemic, knowledge-based resources as its prime competitive tools. As Andreu and Ciborra (1996) suggest, resources used in context can develop into core competence capabilities that can differentiate. The use of core competencies or capabilities, a key aspect of resources, as a basis for an ISS is contrasted here with the use of a structural approach exemplified by the value chain.

There is much in the resource-based view that is intuitively appealing for understanding SMEs' use of IS. SMEs are typically unable to restructure the industry to gain competitive advantage, as they are often small producers in near perfectly competitive markets unable to influence price or quantity. While IS do enable some competitive advantage from collaboration with customers and suppliers, as Porter suggests, the structural view does not explain why some SMEs are innovative with IS and others in the same market conditions are not. The resource-based view suggests context is vital—for instance, the SME's owner-manager's attitude and experience of IS will impact heavily on the role of IS. Further, as Loebbecke *et al* (1999) argue, SMEs are generally poor at knowledge management. In part this is a structural constraint—SMEs in homogeneous markets do not have knowledge that confers competitive advantage and are poor at contractual relationships due (primarily) to resource poverty. The latter limits SME's use of property-based resources, and the former will temper their ability to use knowledge-based resources. However, SMEs are not a homogeneous group and there is an identifiable subset that may be characterised as 'knowledge-based'. These are the most interesting places to explore the application of the resource-based view of the firm to SMEs' use of IS. Using participant observation research in a not-for-profit organisation, Priority Estates Project Ltd (PEP), that provides consultancy in social housing, this paper investigates these issues.

SMEs, IS and IS strategy

SMEs have much to gain from strategic IS. Some success has been observed where information is used to develop new products and markets, with the incorporation of IS/IT into future business plans (Naylor & Williams, 1994). However, the experience of strategic IS planning (SISP) in SMEs is usually focused on improving operational processes rather than achieving strategic objectives (Hagmann & McCahon, 1993). Blili and Raymond (1993) develop an approach that recognises the different imperatives driving IS in SMEs. However, this largely focuses on an IT strategy rather than an overall IS strategy.

A common theme running through the SISP literature is the connection of IS/IT strategy with business strategy, and so frameworks from strategic planning are adapted and utilised with an IS/IT perspective (Earl, 1989; Ward *et al*, 1990). IS/IT plans and strategies should be linked directly to the objectives and strategies of the business unit and be considered as part of the overall business planning process (Ward *et al*, 1990). Most models and approaches to IS/IT strategic planning recognise this link with business strategy.

In many respects the methods used in IS strategy planning are essentially 1980s strategic models applied from an IS/IT perspective. Much of the strategic thinking embedded in SISP processes is derived from the work of Porter and Millar (1985), who highlight the transition of IT from support service to strategic resource, and explicitly connect information with creating and sustaining competitive advantage. Using the value chain and five forces models, they show how IT can change the nature of competition by altering industry structures, supporting cost and differentiation strategies, or even spawning new businesses. While this structural view has proven beneficial, insights from a resource-based view involving core competencies may be of more value to knowledge-based small businesses. Andreu and Ciborra (1996) suggest that IS can be an integral part of core capability development in two ways. First by improving work practices and communication to ensure resource-based capabilities are understood and used across the organisation. Second, by considering the differential advantage that can be leveraged through making capabilities 'rare, valuable, difficult to imitate and with no strategically equivalent substitutes'.

SISP in SMEs

Strategic IS planning in SMEs is underdeveloped. Hagmann and McCahon (1993) find little evidence of it in 300 US SMEs. Blili and Raymond (1993) develop a simple process framework for SMEs based on environmental analysis, current critical success factors, and the current IT situation. Levy *et al* (1999) use Earl's (1989) framework of frameworks to explore the applicability of IS strategy frameworks to SMEs. They find that the value chain and five forces analyses, in particular, are of value, but conclude that the applicability of IS strategy frameworks needs to be assessed in contexts other than those in which they were derived.

Blili and Raymond (1993) concur on the usefulness of the five forces and value chain analyses and propose a market hierarchy framework supporting Levy *et al*'s (1999) emphasis on the importance of customer linkages. These two sets of authors highlight the use of 1980s strategic frameworks rather than a reflection on the business processes and core competencies or resources of the firm.

Limitations of structural analysis

Value chain analysis (Porter & Millar, 1985), a key tool of structural analysis, is almost ubiquitous as an exemplar framework for use in the SISP process (Synnott, 1987; Earl, 1989; Ward *et al*, 1990). However, there are difficulties in applying it to knowledge-based firms. Doyle (1991) cites law firms and financial services as environments that do not lend themselves to value chain analysis. He points out that such activities do not have prototypical value chains. Table 1 summarises the diffi-

Table 1 Value chain analysis applied to knowledge-based firms

Characteristics of value chain analysis	*Characteristics of knowledge-based firms*
Orientated towards the production of goods rather than services.	Produce intangible services based on knowledge and experience.
Implicit primacy of primary activities over support activities.	Support activities have a much greater importance, directly adding value through human creativity.
Uni-directional, following the flow of physical materials.	Operate a feedback loop mechanism, continually gathering information, developing skills and using experience to enhance the service product.
Reflects capital investment priorities of plant and machinery.	Human assets are more important than capital assets.

culties in applying value chain analysis to knowledge-based firms.

Table 1 demonstrates that knowledge-based SMEs may need to use other processes to develop effective SIS planning. There are two reasons for this. First, the iterative nature of the process means that the added value is difficult to gauge at any one stage. In other words, the value chain is less than clear in knowledge-based firms. Second, the importance of the people in the process means that core knowledge tends to be held informally. A knowledge-based SME is likely to use systemic resources as identified by Miller and Shamsie (1996), as their strategic advantage is in being able to leverage the knowledge of individual experts through collaboration. Rangone (1999) suggests that a resource-based view of strategy is appropriate for small businesses. The focus of the strategic analysis should only be on those resources that are critical for the achievement of sustainable competitive advantage. Three core capabilities are identified as suitable for SMEs. These are, first, innovation, the ability to develop new products and services. The second is production capability, the ability to make and deliver to customers. The third core capability is marketing. The extent of these capabilities in small businesses depends upon their strategic direction.

Thus, SMEs may develop resource-based core capabilities that cannot easily be imitated, a prime requirement for resource-based strategy. An alternative approach may be needed for the development of SISP in knowledge-based organisations.

IS and knowledge-based SMEs

Sveiby and Lloyd (1987) describe knowledge-based firms as those whose services are heavily customised to their clients' needs. They are characterised by non-standardisation, creativity, high dependence on individuals and complex problem solving. They are firms in which the key resources are people. Positioning such firms on the Porter and Millar's (1985) information intensity matrix reinforces this view (Figure 1).

The positioning of consultancy, essentially a knowledge-based activity, is informed by Ward's (1988) positioning of legal services and education, although amended by Doyle's (1991) suggestion that an information-rich process is necessary to build an information-rich product. The information intensity matrix suggests that possibilities exist for knowledge-based consultancies to use IS/IT as a competitive weapon, not only for the product itself but also within the production process of the product, as proposed by Andreu and Ciborra (1996).

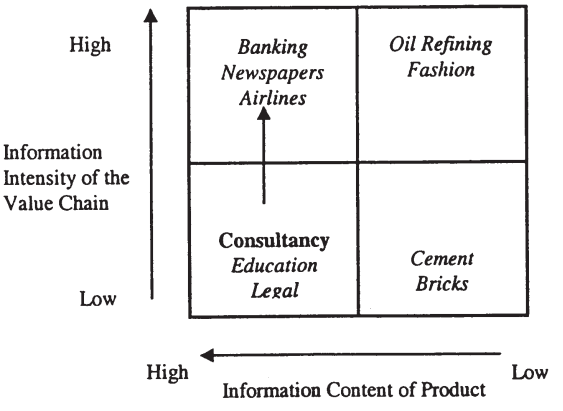

Figure 1 Porter and Millar information intensity matrix (adapted from Earl, 1989).

While the structural view and its concomitant strategic management tools can be used advantageously in the SISP process, the resource-based view of strategy also yields benefits. Prahalad and Hamel (1990) assert that competition in the 1990s requires firms to identify, cultivate and exploit 'core competencies'. Core competencies are the collective learning of the organisation. In particular, they involve the process skills of co-ordinating a diverse range of competencies directed towards a market segment. Core competencies should constitute the focus for strategy at the corporate level. This principle is appropriate for a knowledge-based organisation.

Extending the concept of competencies, Sanchez *et al* (1996) suggest the obsolescence of existing perspectives on strategic management. Concepts of industry structures and portfolio analysis are being replaced by empha-

sis on intangible concepts of skills, technologies, and competencies. Many of these intangible assets are capabilities and knowledge, that when deployed in a co-ordinated manner, become the core competencies of the firm. These core competencies are the real area of competition rather than end products that are merely their expression. While Porter argues that competitiveness could be gained through structuring within an industry framework, the resource-based view argues that it is variety created by individual firms that increases competitiveness (Dyer & Singh, 1998).

Firms exploit their existing capabilities through 'competence leveraging'; attacking new markets or strengthening positions through focused deployment. They can engage in 'competence building', creating new capabilities or developing new abilities to co-ordinate existing ones.

As Sanchez *et al* (1996) observe, this theory is developing. Its vocabulary and theory are not well defined; interpretation is idiosyncratic. There are no well-tried tools or frameworks to assist strategic management from a competence-based perspective. Not surprisingly, no SISP tools or frameworks have been developed. Managers therefore have three alternatives. First, to use the conventional tools and frameworks of SISP, with their acknowledged limitations. Second, to identify tools more closely aligned with core competence theory and third to derive new tools from the theory.

Use of conventional tools and frameworks

Insights gained from the use of conventional tools are not invalidated by a focus on competencies. However, these insights need to be relevant in terms of competence-based strategy. Questions such as 'what does this say about the firm's competencies and its learning processes?' and 'how does this assist competence leveraging or competence building activities?' help reinterpret the outcomes in terms of competence-based strategy. Dyer and Singh (1998) observe that the industry view of competition can be useful in providing insights, particularly in collaborative ventures. They recognise the need for both resource-based analysis and industry analysis in managing firm growth.

Other tools

Whilst there are no tools specifically addressing competencies, there are a number of methods derived from a systemic view of problem situations that may generate insight. One used with some success in the development of IS is Soft Systems Methodology (SSM) (Checkland & Scholes, 1990). From both a competence and an IS perspective SSM has a number of positive features:

- It is systemic and, hence, accommodates feedback loops and learning processes.
- It allows investigation of competence-leveraging and competence-building activities through root definitions of suitable systems.
- It allows the derivation of information needs through development of conceptual models.
- It is applicable in problematic situations where conventional strategy tools are less useful.

Although SSM can be adapted to investigate information needs, it cannot of itself draw out strategic opportunities that still remain the province of the structuralist strategic management frameworks.

New tools

Prahalad and Hamel (1990) suggest a hierarchical model of core competencies that are made manifest in core products, and, in turn, contribute to end products flexibly constructed to target specific market segments. They suggest three criteria by which core competencies can be identified:

- potential access to a wide variety of markets;
- significant contribution to perceived customer benefits of end products;
- difficult for competitors to imitate.

Application of these and the hierarchical model give insights into the competence structure of the firm, and the strategic opportunities for competence leveraging and competence building.

A more sophisticated approach to competence analysis produces a competence map for the business (Lewis & Gregory, 1996). A major practical benefit is claimed to be that of 'providing the management team with the ability to add consideration of competence building and competence leveraging into their strategic formulation process'.

Using IS/IT to support learning processes

Andreu and Ciborra (1996) consider the development of core capabilities to be a fundamental learning process. They explore how IS/IT can contribute to the learning aspects of competence development by taking a resource-based view of the firm, where IT aids the transformation of standard resources into core capabilities.

From a competence-based strategic perspective IS/IT applications need to be identified that support competence leveraging (Sanchez *et al*, 1996) and competence building (Andreu & Ciborra, 1996).

The research approach

This research is exploratory in nature. The tools that are being applied to the situation have not been used previously in this combination to develop an IS strategy. Hence a qualitative research approach is likely to be more effective than a quantitative approach. As Silverman (1998) argues, 'the strength of qualitative research, for both researchers and practitioners, is its ability to focus on actual practice *in situ*'. The intention

is to use a single case study using participant observation to identify whether the core competence approach to information systems strategy can be said to provide a more appropriate approach for a knowledge-based organisation. Hill and McGowan (1999) suggest that small company research may be best done using a qualitative approach that includes participant observation, case studies, in-depth interviewing and use of documentation. Yin (1989) argues that single case studies have the capacity to enhance our understanding of situations. While the results may not be generalisable, insights and understandings are gained through working closely with managers throughout the research process.

The approach taken is that of participant observation of the organisation. As Nandhakumar and Jones (1997) describe, participant observation involves the researcher's active involvement in the organisation's activities, pertinent to the research being undertaken. They suggest that in IS research this might mean working as a developer in the company. This was the approach taken here. The first author worked with the organisation to develop an IS strategy for a three-month period, full time. This enabled the researcher to gain a good understanding of the issues and concerns of the people in the organisation. The researcher had previously worked with the organisation to reorganise the finance function in the company. Through liaising widely in PEP the author accumulated a mass of background knowledge and material, and more importantly developed relationships throughout the company. At that time it became clear that the organisation could make more strategic use of IT, hence they were supportive of the request to develop an ISS. The researcher was accepted as part of the organisation and the access he had enabled him to participate closely with all staff involved on a day-to-day basis. This is a key part of participant observation (Seltsikas, 1999).

Background to PEP

Priority Estates Projects Ltd provides consultancy and associated services in social housing. It has a turnover of £1.4 m and employs around 40 people. PEP has around 250 clients: local authorities, housing associations, resident groups and local housing firms. It supplies a wide range of services in compulsory competitive tendering, tenant participation, estate management, and the right to manage. PEP also runs training courses, seminars and conferences. PEP works in a politicised environment, relying on government funding of housing projects. The structure of the social housing industry is fragmented with a few national agencies like PEP and hundreds of local consultancies.

PEP has active projects throughout the UK. PEP is organised into three Regional Teams, based in London, Birmingham and Manchester, that are self-managing and autonomous, with responsibility for their own financial and operational performance. They decide their own strategic priorities and construct their own business plan. They are managed by a Regional Co-ordinator assisted by a Business Manager who handles day-to-day interactions with the consultants. Consultants work from home, spending most of their time on-site with clients. They are self-managing and have almost complete control over their working time. Each month every consultant submits a paper document containing details of client hours worked, expenses incurred and other activities. They receive feedback including chargeable hours worked and expenses incurred to facilitate their workload management. This is called the Project Progress Report (PPR) system and is at the heart of operational management of Regional Teams.

SISP process in PEP

The process began with a presentation to the Senior Management Team on the concepts of core competence, their relevance to the SISP process, and a discussion about what might constitute the competence set for PEP. Over a period of four weeks interviews were held with key staff in London and Manchester. Three SSM workshops were held with the P&M manager, the Northern Team Leader and business manager, and the Southern Team Leader and business manager, respectively. Another three informal workshops were held with team business managers and the finance manager to assess the relevance and applicability of emerging themes.

Interviews with key personnel in PEP and analysis of reports and documentation associated with management of the regional teams are the data sources for the core competence and SSM analyses. SSM analysis leads to the identification of business themes that are essential for leveraging competitive advantage through IS/IT, while core competence analysis identifies the critical resources that PEP exploits in its chosen market place. Prahalad and Hamel's model is used to explicate the core competence structure of PEP within the context of its core products, finance and customer perspectives. Information needs are defined for those business themes identified as being essential for core competence leverage. Figure 2 presents a diagrammatic view of the process.

Data gathering

Data were gathered via a series of semi-structured interviews covering the full range of PEP staff (Table 2). The interviews focused on eliciting information needs for current operations and attempted to identify the key organisational competencies required for PEP to compete effectively in current markets and exploit strategic opportunities in the future.

The interviews generated, at the operational level, a

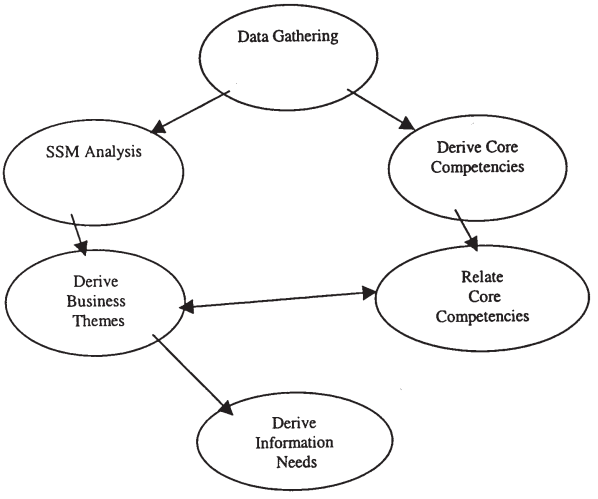

Figure 2 Deriving business themes through information needs analysis.

detailed list of information needs that would allow staff to manage, administrate or deliver services better. At the strategic level a number of issues emerged:

- The accounting system could be enhanced to give more appropriate financial analysis to Regional Teams and senior management. This also presented the opportunity to build financial models of the Regional Teams and PEP as a whole.
- Regional Team management was compromised by inefficient data collection mechanisms, and by inadequate analysis and reporting. Feedback to consultants was slow and unpredictable.
- There was no effective method collecting and collating marketing information about clients that, in principle, was available from a variety of sources. Marketing and selling were *ad hoc*, undertaken by Regional Teams or individual consultants.
- There was general frustration that despite the quality of consultants, there was a failure to gather and disseminate their experience as training materials, templates for presentations, survey questionnaires etc. A 'Resource Library' fulfilled this function, in principle, but was rarely used or updated.
- As a major symptom of the last two points was a general conviction that 'Promotions and Marketing (P&M)' was insufficiently integrated into the information flows of PEP and was not providing the service required of it.
- Generally communication within teams, between teams, and with the Senior Management Team was considered cumbersome, untimely, and inefficient, reinforcing the difficulties of consultants working remotely.

In addition, three management perspectives became apparent from the interviews:

First, there is a customer-orientated perspective that attempts to identify sets of customers with common attributes or interests. This perspective is required as a basis for making promotional initiatives.

Second, there is an income perspective that categorises different types of payment regime or income categories (eg Section 16 Promotion—grant funding from the UK government for seed corn promotion of participatory tenant management) and is the perspective through which the financial performance of PEP is observed.

Finally, there is a product perspective that attempts to identify common products that are supplied to customers. Products and services delivered are frequently tailored specifically for the customer and are consequently diverse.

The relationships between PEP's customers, the products and services they take, and the income category

Table 2 Interviewees and indicative content

Position	*Interview content*
Senior Director and Consultant	Mission, objectives, strategy. External environment—political & economic. Housing policy, trends. PEP as an organisation.
Senior Director and Consultant	Mission, objectives, strategy. Structure of PEP business, customers, products, services and skills. Selling process. Possibilities for IS/IT.
Regional Coordinator, Consultant and Regional Business Manager	Financial aspects of Regional Team management. Project management and resource scheduling. Selling process. Marketing and central Resource Library.
Regional Coordinator and Consultant	Project management, resource scheduling. Marketing and tendering. Shared budget management information, client communications. Electronic Resource Library and communication.
Finance Manager	Corporate Finance and Regional Team finance requirements. Budgeting and business planning. PEP business model.
Consultant	Field work—nature of, use of IS/IT. Selling process. Training materials, team working, communications, products. Potential for knowledge-based, organisational learning.
Manager P&M	Marketing, market analysis. Mailing lists and promotions. Competition. P&M function within PEP.

through which they take them, are complex. Interestingly, these are identical to those identified by Rangone (1999).

Strategic analysis and debate is dogged by indiscriminate use of these different perspectives. The end result is that the debate is confusing and a common understanding of strategic approaches is hard to establish. The approach taken to reconcile these conflicting perspectives is, first, to identify the core competencies for PEP and, second, to analyse them using SSM.

A core competence analysis for PEP

The Prahalad and Hamel model provides the only means to date of modelling core competencies. The model has as its basis core competencies that are defined as the critical resources found in the business and are embodied in core products. Finally they are delivered through strategic business units to customers.

The core competence model of PEP can be mapped directly onto the Prahalad and Hamel model, other than the income category replacing the strategic business unit component. This is done because PEP differentiates its activities by the nature of the type of business and the way it is commissioned. This leads to differential charging to support different grant regimes. However, all staff are involved in all the various income-generating activities. Hence, while the activities are distinct, the size and structure of PEP suggests that strategic business units are inappropriate and income categories will be more meaningful.

Using the working definition of core competencies/capabilities as 'those competencies that management perceive as of central importance to the company's goals and strategy' (Lewis & Gregory, 1996), all interviewees were asked about what they considered to be the core competencies/capabilities of PEP. Table 3 represents a broad consensus of these views.

Figure 3 demonstrates that PEP can be described from a core competence perspective. Strategic opportunities for competence leverage and building may now be identified. This is done using SSM analysis.

Table 3 Core competencies of PEP

Housing Management theory and practice.
Research (interviewing, designing and conducting surveys) skills.
Group work skills/community work skills.
Event management skills.
Training skills.
S16 and other grant regime procedures.
Project Management skills.
Communication (writing/publicity/etc) skills.

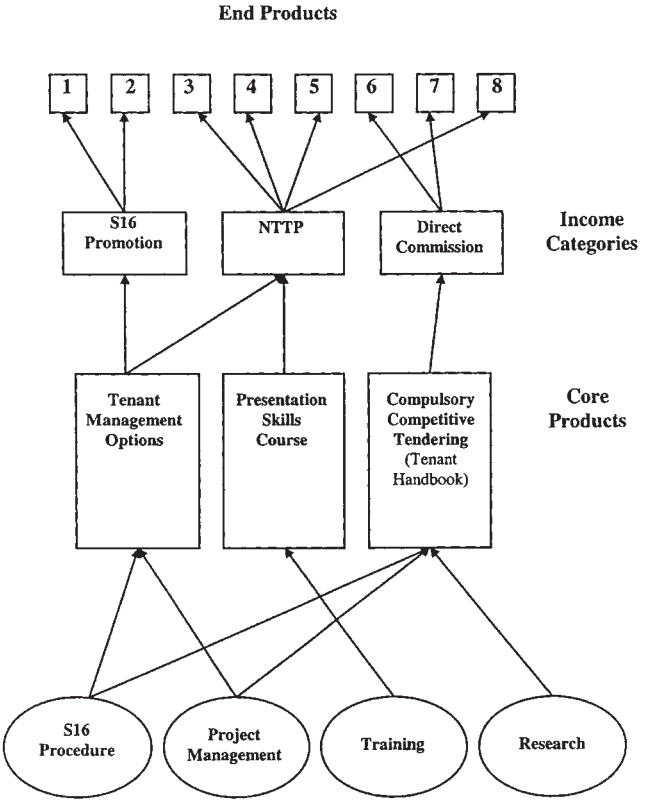

Figure 3 Competencies/product/income model (Adapted from Prahalad & Hamel, 1990). (Figure shows only a selection of competencies and products.)

SSM analysis in PEP

The SSM analysis was developed from the interview material and workshops with managers to verify and develop the analyst's understanding. A key issue for the analysis is that the resulting rich picture is a composite of different views of the situation in PEP. The model acknowledges the different roles, norms and values found in PEP and develops a model of the perceived 'social system' (Checkland & Scholes, 1990). This 'Analysis Two' mode of SSM is rarely complete because of its reliance on perceptions from different actors. Checkland and Scholes acknowledge the difficulty of identifying norms and values, particularly from interviews. The participant observation approach provides a means of developing additional understanding of these norms and values by involvement in the business. In PEP the roles for the consultants were professional in that their knowledge in the housing field brought respect from their peers. The values found in PEP are those of social justice and commitment to social housing. The norms in PEP show a situation where independence is valued. However, management now find this inhibits effectiveness as the organisation grows. Figure 4 shows the resultant rich picture.

Three major issues emerged from the analysis:

- The difficulties of Regional Co-ordinators in

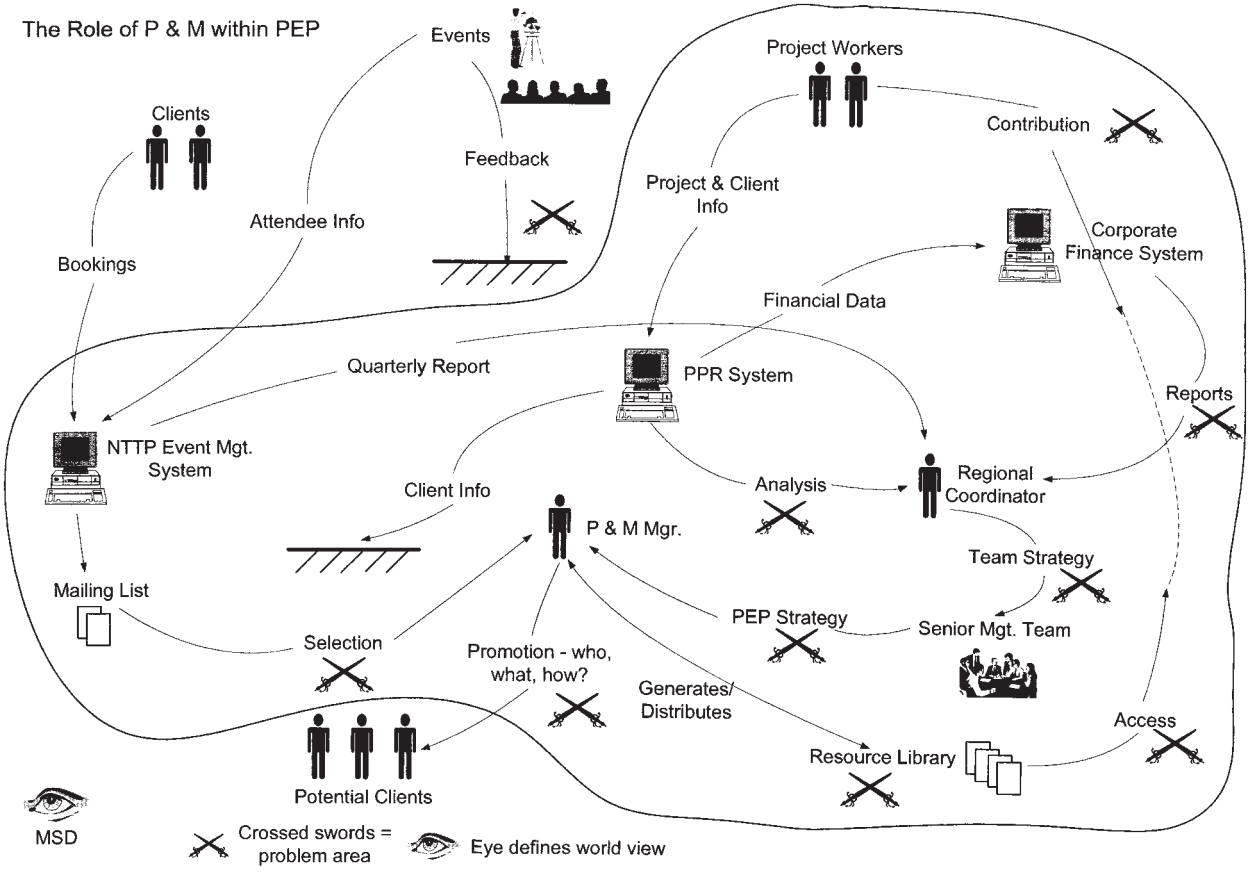

Figure 4 Rich picture of key processes and interactions in PEP.

obtaining operational and financial reports from the PPR and Finance Systems.

- The lack of client information flows into promotion and marketing, preventing marketing analysis.
- The inability of consultants to contribute their own materials and experience to the Resource Library, and to access and retrieve material.

These problems suggest the need for three key transformations.

Uninformed Regional Team Strategy	→	Analyse Operational, Financial and Marketing Information	→	Informed Regional Team Strategy
Unstructured Marketing Data	→	Collect and Analyse Marketing Data	→	Structured Marketing Information
Need for PEP-wide sharing of resources, experience and learning	→	Set up, maintain, and grow Knowledge Base	→	Need for PEP-wide sharing of resources, experience and learning satisfied

Each of these key transformations was examined through root definitions, conceptual modelling and comparison with real world feasibility. An example conceptual model of a marketing analysis and support competence is shown in Figure 5.

In addition the analysis identified two issue-based systems that cause concern among some actors in PEP. First, *control and planning* is seen as difficult in PEP, primarily because of its loose network structure as well as the independent nature of consultants. The problem owners, particularly, perceive that growth is inhibited by a lack of business and financial planning. Second, *communications* are recognised by many of the players to be an inhibiting factor in disseminating knowledge throughout the organisation, making it less effective in carrying out its primary role.

These five systems can be considered in Earl's terms as business themes. They represent key areas of capability or competence in which PEP needed to excel to meet their strategic objective (Table 4).

Relating core competencies to business themes

The earlier core competence analysis highlighted eight areas that are thought critical for success by PEP staff.

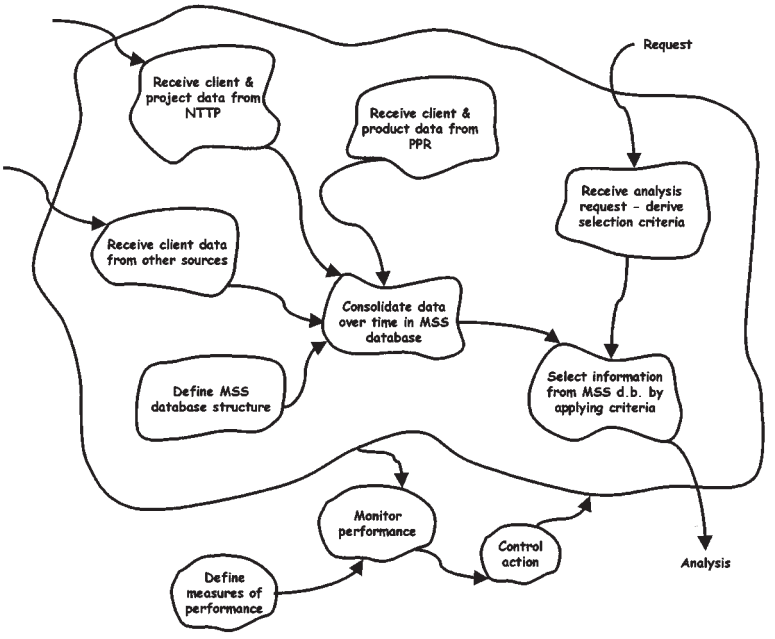

Figure 5 Conceptual model of marketing support competence.

Table 4 Emerging business themes for PEP

Operations Management	Means by which the operations of Regional Teams are planned, managed and accounted for, within the Team, and also communicated within PEP.
Marketing Support	Accumulation and structuring of all client data, operational and qualitative, to provide analysis to support operations, marketing, strategy formulation and planning.
Knowledge Base	Institutionalisation of firm-wide experience as standard documents, training courses, project experience etc to enable access and sharing by PEP personnel to facilitate and enhance their activities in the field and within PEP.
Communications	Mechanisms by which communications of tangible and intangible information and knowledge are facilitated throughout PEP regardless of structure or geography.
Control and Planning	Financial control and analysis throughout PEP, together with the formulation of Business Plans both short and longer term.

As Rangone (1999) indicates, core competence leverage is key to the development of strategic growth in SMEs. The five business themes highlighted by the SSM analysis provide the means by which these core competencies can be leveraged to enable strategic growth in PEP. Figure 6 demonstrates the connection between core competencies and business themes.

The three primary task business themes map directly onto the core competencies. However, there are no core competencies that connect either to control and planning or communications. These two business themes are derived from issue-based systems and represent skills that are needed throughout the organisation. Thus, they are critical to enable effective leverage of all the core competencies.

Matching information needs to business themes

Information needs of managers were identified through the interview process. The SSM analysis and core competence analysis allows refinement of these information needs through identification of those that are necessary to support business themes. Table 5 indicates the business themes and their associated information requirements.

This table suggests that not all core competencies are being used in PEP. For example, events management is not included in any of the information issues raised in operations management. In the knowledge base area all core competencies are used, which is not surprising, as these are the critical activities for PEP. Again in Marketing Support, communications appear to be most important. There are no clear core competencies indicated for the two issue-based themes. The reason for this is that these business themes and information needs are those that all businesses require for effective management.

SISP recommendations

The SISP process identified areas of key capability (or core competence) that PEP needs to establish to fulfil its

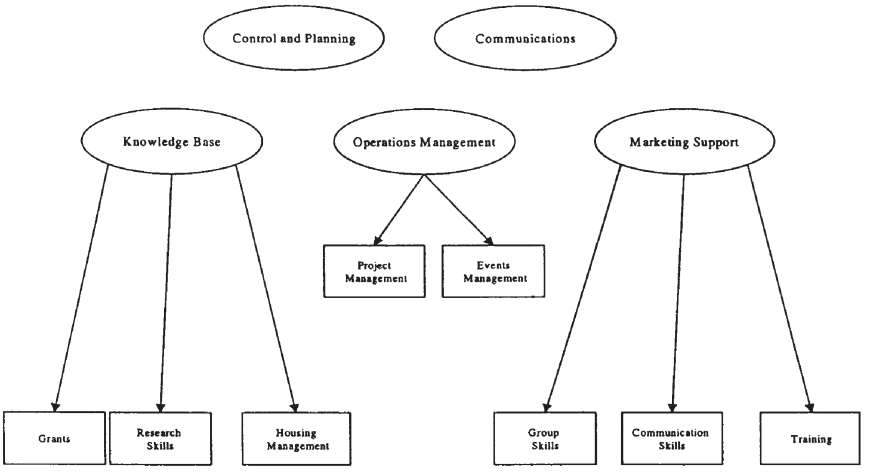

Figure 6 Relationship between business themes and core competencies.

strategic objectives. Table 6 tabulates the three primary task business themes with a summary of information needs. These, in turn, require actions to satisfy these needs, that, in essence, define the application development portfolio as a deliverable of the SISP process.

The initial outcome of the models is a developed set of short and long-term business themes as advocated by Earl (1996). Business themes encapsulate the current business direction as a means of determining implementable strategies. This approach recognises that IS strategies are only one of the resources required for flexible strategy development. Thus, business themes have some correspondence with competence leveraging and competence building activities.

Recommendations for IS/IT developments in PEP

A report was delivered, and recommendations made, to the Senior Management Team on 24th April 1997. Presentations and discussions were also held at Regional Team Meetings in London, Manchester and Birmingham.

The report's recommendations were incorporated in an 'Implementation Schedule for Business Themes'. This outlined a timetable for the implementation of firstly, *IT Infrastructure and Communications*, then the business themes of *Control & Planning* and *Operations Management*. These were to be followed in the longer term by the themes of *Marketing Support* and *Knowledge Base*.

IS/IT applications are developed within the context of business themes following Earl's (1996) organisation approach to IS strategy. The proposals for an improved IT infrastructure are also discussed, particularly its contribution to the business themes of communication and control and planning.

Communications

Communications are essential for achievement of all core competencies. As such it becomes an infrastructure issue, not only involving connectivity but also the medium of information transfer. Thus development of an Intranet would facilitate file transfer throughout PEP. It would also enable the support of the Knowledge Base through the use of search engines. Additionally, Internet facilities would enable improved marketing facilities. For example, hypertext can be used to structure complex networks of home pages, indices, documents, pictures, sound and video. File transfer protocols allow distribution and contribution mechanisms.

Control and planning

The main objective here is to improve financial planning and control. The accounting system needs to be improved to be able to report in a more detailed format to satisfy business requirements. There is also a need to improve financial analysis capabilities for PEP. In particular, it would be helpful to construct a financial model of PEP. This would allow investigation of sensitivities to changes in grant regimes, sales mix and cost structure. It would facilitate the development of the annual business plan and allow financial projections on the basis of performance variations against budget.

Operations management

Managers have identified a need to monitor projects and financial progress more effectively. The project progress reporting systems need to be redeveloped to allow more detailed and frequent reporting, particularly to satisfy the regulatory needs of the Department of the Environment.

Additionally there is a need to review the financial system to enable managers to have access to the information they require to support their project progress reporting.

Table 5 Business themes and information needs related core competencies

Business theme	*Information need*	*Core competence*
Operations management	Resource schedules and diaries.	Project management
	Project progress reports—resource, expenses and money equivalents against budget.	Project management
	Team performance – time usage, chargeable and non-chargeable, expenses, utilisation, and realisation.	Project Management
Knowledge Base	Access to Regional Team and/or Corporate Resource Library.	Housing Management Grants Research Skills
	Access to PEP corporate Knowledge Base.	Housing Management Grants Research Skills
	Access to Personnel Knowledge Base.	Research Skills.
	Templates for Responding to ITTs.	Housing Management Grants Research Skills
Marketing Support	Customer/Contact Database	Communications Skills
	Access to Tendering Results Analysis	Communication Skills
	Broader and deeper marketing information about attendees and their organisations.	Communication Skills
	Clear up-to-date information on PEP clients and services being provided.	Communication Skills
	Clear information on target audiences.	Communication Skills
	Feedback on initiatives, monitoring of results.	Communication Skills Training
	Skills and Materials *vs* Products	Group work Skills
	Products *vs* Customers.	Group work Skills
	Products *vs* Margins	Communication Skills
	Customer Identification and Contact Points.	Communication Skills
	Customer Needs and Perceptions.	Group Skills
Communications	Access to Regional Team and/or Corporate Resource Library.	
	More effective/less time-consuming inter-Team, intra-Team, and Corporate communications.	
Control, Planning	Margin analysis by sales category.	
	Financial reports—team performance against budgets.	
	Corporate financial reports.	
	Restructure of nominal accounts with respect to sales categories and overheads.	
	Contribution by sales category.	
	PEP Financial Model.	

Marketing support

The case analysis has identified that marketing support is a critical area for PEP if it is to grow. Marketing is a new area for PEP but one requiring a major investment from PEP and is unlikely to be undertaken soon. However, the importance for PEP of being able to undertake client analysis to assist in future strategic plans and their marketing make it an important area for consideration. A marketing system would facilitate competence leveraging activities by applying core competencies and products to new market segments and also identify segment for which new competencies are required with implications for competence building.

Knowledge base

The concept of a knowledge base for PEP is highly strategic. In essence, the organisation needs a knowledge management system to capture the corporate experience, information, capabilities and materials that are essential for the future of PEP. The knowledge base will also provide an environment and engine for organ-

Table 6 Business themes, information needs and consequential actions

Business theme	*Information implications*	*Actions*
Operations Management	Requires accumulation and analysis of project-related data over time. Needs Marketing Support through analysis of existing information and projections for future initiatives.	Enhance PPR system to provide required analyses. Provide channel to input project related data into marketing support system.
Marketing Support	Requires structured analysis of data sets to create and maintain support database. Requires defined inputs from NTTP and PPR systems to maintain database over time. Marketing support initiatives driven by operational strategies.	Explore and build on competence orientated model of PEP's products and services. Design and implement Marketing Support System. Include input channels from NTTP and PPR.
Knowledge Base	Requires structured view of what constitutes a Knowledge Base. Suggestions might be:- Standard material for recurrent training courses. Procedure guides for regulatory schemes such as Section 16 etc Experience guides to managing meetings, conducting surveys etc Personnel skills/expertise base. Discussion groups on topics of interest.	Initiate exercise to derive requirements for Knowledge Base. Set out parameters for creation and management of Knowledge Base. Select 'experts' to contribute standard material by topic.

isational learning. This supports the Andreu and Ciborra (1996) strategic learning loop by building competencies that will differentiate PEP. For example, the ability to bring national experience to bear on local projects, the development of libraries of standard procedures, the ability to consult across the organisation are all differentiating competencies for PEP.

Summary

Five business themes have been identified for PEP. Three are directly linked to core competencies that can assist in leveraging the business. Two, communication and control and planning, are over-arching themes that are necessary for managing business growth. Systems are identified to assist PEP in both areas. The following section reviews the actions PEP have taken since the IS strategy was developed.

Implementation of the information systems strategy

IT infrastructure

The SISP exercise and associated report gave PEP the impetus to build on the momentum for developing IS/IT following the successful implementation of a computerised accounts system. With the help of an external IT consultancy PEP have put in place an IT infrastructure to support the organisation. The London and Manchester offices are fully networked with all employees having PCs and each office having a file server. The two offices are connected via an ISDN line. Remote workers have dial-up access to their servers and hence have e-mail provision and the ability to up and download files. PEP have standardised their software and have developed a productive relationship with a supplier of IT hardware and software capability.

Operations management

The reporting of consultant time and expenses against projects is now undertaken entirely electronically, and consolidation is achieved through a complex spreadsheet program. Consultants can monitor their performance and that of their projects through access to a variety of reports. Considerable time was spent in an abortive effort to make use of a commercial package, but this failed due to emerging inadequacies of the package and a lack of support from the vendor. A custom-built database solution has been designed and awaits development by the IT consultancy.

Knowledge base

The provision of IT infrastructure has facilitated several developments towards an organisational knowledge base. Tendering for projects now has a centralised file-store database of all past tenders, invitations to tender and information relating tenders to consultants' expertise. Standard proformas for all tenders, and e-mail have facilitated the tender build process by multiple consultants.

Training course materials have been captured for all

the key repeated courses. Consultants access these remotely and customise them. There is a library of news updates, reports on social housing, and research documents accessible to all the members of PEP. A bulletin board has been set up to encourage the sharing of expertise, knowledge and experience and promote debate and discussion. PEP are planning to reorganise their knowledge base to allow a web style browser interface.

Marketing support

As was indicated in the recommendations, this was seen as a long-term activity and radical change was not expected. Indeed, little progress has been made, although all training course customers are now recorded on a database.

The Internet

PEP now has a high quality Website, developed through the IT consultancy, that presents a comprehensive view of PEP, the organisation, its capabilities, projects and news, and contact details. Both offices have Internet access which is used for researching government databases and arranging and purchasing travel and accommodation requirements.

Summary

Since the SISP exercise was undertaken PEP has gone from a position of having few information systems to having many. Interviewees indicate that the exercise allowed them to see their organisation from an information perspective, not only as a means of monitoring, control and planning, but also presenting possibilities for knowledge accumulation and dissemination.

Whilst PEP have not explicitly organised their developments around the Business Themes recommended by the report, they have essentially pursued those of Operations Management, Knowledge Base and Communications. The champions/enthusiasts for these developments are the finance manager and business manager based in Manchester.

Discussion

The discussion reviews core competence theory for IS strategy in the light of the experience at PEP.

The literature on SISP in SMEs suggests that SMEs differ from large organisations and, hence, so must SISP processes. Whilst also observing the large variation in the impact of IT in SMEs (Cragg & King, 1993; Naylor & Williams, 1994; Doukidis *et al*, 1996), the implicit assumption is that the generic term SME is adequate for discussion of SISP.

This paper questions this view and highlights a category of SME, knowledge-based firms, in which IS/IT has a large potential impact. The paper shows that these firms might benefit from analysis through a competence-based view of strategy. Knowledge-based firms are characterised by the intangible nature and high information content of their product, and its significant customisation for the client. This has been demonstrated through the analysis of PEP for whom information about housing issues, grant requirements and client needs is critical.

Other examples include IT consultancies, advertising agencies, graphic design companies, HRM consultancies, and solicitors. These types of firms proliferate in an environment where large organisations outsource non-core capabilities. The non-core capabilities of large firms are becoming core competencies of knowledge-based firms and so a competence-based view of strategy may be appropriate for them.

This perspective has particular benefits in the environment of SMEs that are dominated by larger customers over whom they have little influence. The politicised context of PEP is a good example. Their need for improved strategic planning in order to respond to changes in government policy, particularly with regard to grant regimes is seen as critical. In such circumstances the competence-focus elicits strategic decisions in terms of competence building and leveraging with a view to generating strategic options (Sanchez *et al*, 1996). Increasing flexibility is inherent in this approach which is beneficial in uncertain environments. Where explicit strategic direction is difficult to determine, focus on competencies allows progress to be made in contexts of environmental complexity.

Limitations of value chain analysis

Value chain analysis would have identified operations management, and control and planning themes, that are primarily concerned with efficiency and effectiveness. Although consideration of the primary activity of sales and marketing may have suggested uses of IS/IT, value chain analysis would not have provoked the insights with respect to core competencies provided by the application of the Prahalad and Hamel model. The potential strategic impact of the marketing support system might have been overlooked. Table 7 compares the generic value chain activities with the emergent business themes in PEP. This table indicates there are some value chain activities that are not central to a knowledge-based organisation.

The most important business theme that would not have emerged from value chain analysis, is that of the knowledge-base. This theme occurs several times in the information needs analysis, but the value chain model has no component that reflects the feed-back learning processes associated with developing core capabilities (Andreu & Ciborra, 1996) inherent in knowledge-based firms. From a competence-based perspective the value chain analysis offers only opport-

Table 7 Comparison of value chain generic processes with business themes in PEP

Generic value chain activity	*Business theme*
Primary Value Chain	
Inbound Logistics	
Operation	Operations Management, Knowledge Base
Outbound Logistics	
Marketing and Sales	Marketing Support, Knowledge Base
Secondary Value Chain	
Firm Infrastructure	Control and Planning, Communication
HRM	Control and Planning, Communication
Product and Technology Development	
Procurement	

unities for deriving competence-leveraging applications, but does not address the possibilities of competence-building.

The strength of SSM lies in the comparison of ideal business process (conceptual) models with the real world. This, together with the information needs analysis, provides a means of determining the information implications inherent in the main business themes and the actions that are needed to ensure that the information is available to managers.

Competence-based view of strategy

The justification for strategic information systems planning is predicated on the recognition of information as a strategic resource and that IT is increasingly pervasive in all aspects of business activity. The intent of SISP is to align IS/IT with business objectives and to search for competitive advantage through its use. A competence perspective on strategy does not invalidate these considerations but rather re-interprets them. Core competencies, especially in knowledge-based firms, increasingly have information at the heart of their content and directing their deployment. Business objectives are realised through exercising competence leveraging and building, while core competencies become the locus of competitive advantage. In PEP it was recognised that an Intranet and also development of Internet facilities would improve information access. Thus, the competence-based view of strategy is vital to SISP, and the methods employed need to incorporate this perspective. The task of SISP then becomes one of searching for opportunities of competence leveraging and building, and investigating the ways in which IS/IT can facilitate and enable these.

Tools for competence-based SISP

There are, as yet, no SISP tools or frameworks derived from a competence-based view of strategy, and this exercise has been conducted largely through conventional frameworks, interpreted from the competence perspective. The Prahalad and Hamel model is beneficial in several respects:

- It illustrates the locus of competition as core products and core competencies.
- It gives direction to the analysis of a firm's competencies.
- It gives structure to the analysis of raw market data that relate to end products.
- It highlights the development of a competence in market data collection and analysis.

Its key limitation is in the process of how to assess, from all the firm's capabilities, those that meet the Sanchez *et al* tests for core competence. This requires a filtering process such as that undertaken by Lewis and Gregory (1996). Tools are needed to establish the competencies of the firm, those required in the market, both now and in the future, and to consider the options for competence leveraging and building.

Role of soft systems methodology

SSM played a significant role in this exercise; rich pictures are able to illustrate problem areas, which may be interpreted as competence deficiencies. Having posited such deficiencies, conceptual modelling was successful in investigating idealised systems for competence leveraging and competence building. While drawing out the implications for real-world action, these models cannot test the validity of the competence identified with respect to the market.

The potential of Soft Systems Methodology in a competence-based view of strategy is as a meta-tool for building further tools to facilitate the competence analy-

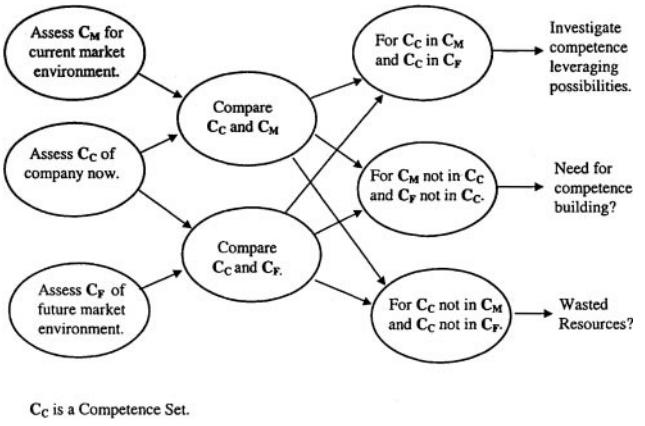

Figure 7 Opportunities for competence building and leveraging derived from comparison of competence sets.

ses of firms and their environments. For example, the Lewis and Gregory process of competence analysis could be described with a Soft Systems Methodology conceptual model. Comparison of competence sets would lead to specific direction as to competence leveraging and building possibilities. Figure 7 shows opportunities for competence building and leveraging derived from comparison of competence sets

Business themes as competence leveraging/building

Having adopted a competence-based view of strategy, the SISP exercise struggled to apply the theory directly due to lack of tools, and had to rely on the interpretation of conventional frameworks. However, if SISP under this perspective is to have credibility then the outcomes must relate to competence leveraging and building, since these are the focus of strategic analysis. The outcomes of this SISP exercise are a number of business themes, some of which have a close correspondence with competence building or leveraging activities.

Table 8 demonstrates that, whilst a business theme may be concerned purely with efficiency and effectiveness, those of truly strategic nature will correspond to competence building or leveraging activities.

Table 8 Competence interpretation of business themes

Business theme	*Competence interpretation*
Operations Management	Quantitative change in ability to manage many projects in the field seen as competence leveraging improving the effectiveness of interaction with the Department of the Environment and allowing potential application across new markets (eg national Housing Associations).
Control and Planning	Not really competence building or leveraging since it does not result in any offering of product to the market. Developments in this theme are directed towards evaluating strategic options generated from competence building and leveraging activities.
Marketing Support	A competence building activity which would facilitate PEP's deployment and co-ordination of resources in offering products to the market.
Knowledge Base	Again a competence building activity enabling new ways of creating product offerings facilitates new ways of deploying resources, and represents a new medium through which new competence building activities could take place.
Communications	Not a competence building activity in itself. Effectively subsumed within the Knowledge Base theme.

Conclusions and research agenda

Strategic thinking has moved from a structural view of competitive advantage to a resource-based view. The resource-based view of the firm emphasises the resources firms need to develop to compete. Two forms of resources exist, property-based and knowledge-based. Property-based resources contribute most in stable settings, while knowledge-based resources have the greatest utility in uncertain environments. While the resource-based view of the firm has substantial theoretical support, it has not been subject to much empirical testing. The resource-based view in the context of SMEs is largely unexplored and the role of information systems is likewise untested.

This paper discusses the role of information systems as firm resources and the role of such resources in SMEs. It uses as a vehicle the identification and development of an information systems strategy in a knowledge-based SME. Systemic, knowledge-based resources are likely to be the prime competitive tools of this type of firm. The use of core competencies or capabilities, a key aspect of resources, as a basis for an ISS is contrasted with the use of a structural approach exemplified here by the value chain.

This paper has described a SISP exercise which, whilst informed by a core competence perspective, was hampered by the lack of tools and frameworks explicitly embodying these concepts. Further work needs to be done in developing tools to facilitate the operationalisation of SISP from a core competence perspective.

Such tools might include:

(i) a method for eliciting and defining the core competencies;
(ii) a method for eliciting and defining the core competence needs for the future;
(iii) a framework for investigating the use of IS/IT in leveraging these core competencies and building new ones.

The two predicates underpinning this paper, the typography of knowledge-based SMEs and the utility of a core competence perspective, need to be tested in other contexts. Further research might consider SMEs that display characteristics of being knowledge-based and use the tools suggested above to test the validity of core competencies as a driver of strategic opportunities for IS/IT in such organisations.

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