Journal of Information Technology (1993) **8**, 217–225

Core competence and learning alliances – the new face of information management?

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Information management methods are now becoming inadequate for the demand placed upon them. A process of evolutionary change, initiated during the 1980s, may not suffice because the current thinking on management theory – upon which information management is defined – is changing significantly. The salient points of this shift in the paradigm of strategic management are outlined and an indication is given of how this will impact the management of information technology. An outline of an adapted model is attempted, using a simple four-component framework: The most influence will be felt in the area of information technology planning. Systems acquisition will need to develop new, proprietary methods. The character of the day-to-day management is also significantly affected, mainly by an increased use of external agents in what will probably be new and innovative forms of alliance. The idea of an information technology *keiretsu* is used as an example of how such alliances could be structured.

The importance of the right management model

Effective and innovative management of information technology is an imperative *sine qua non* for competitive success (Kearney, 1984) – in any industry, for the local firm, the national firm or even a country, whether competing regionally or, with increasing inevitability, at a global scale.

For management to be effective, the structures and processes it applies must be appropriate to the nature and characteristics of what it is managing. Information technology itself has been changing at a rapid pace during the last ten years. Even more significant is the change in its role within the business process. It is argued that the model for the management of information technology in use now is inadequate for the demands placed on it. There are two reasons for this:

- the model is based on assumptions about the nature of information technology which are now incomplete and, at least in part, invalid;
- the fundamental paradigms of strategic business thinking upon which information technology management rests, seem to be changing.

This exploratory paper first discusses the change in the nature of information technology. Secondly, the perceived paradigm shift in the theory of strategic management will be described in brief. Lastly an attempt is made to set out where and how the model for information technology needs to be adapted and some areas for further research are sketched out.

A model for data processing

The frameworks for the management of information technology stem from the early 1970s (Cash *et al.*, 1988). As they are based on the body of experience built up during the 1960s, they are rooted in the era of data processing, which is different from that of information technology. Data processing was characterized by a dominance of centralized mainframes, with restricted facilities for on-line terminals and a subsequent orientation for batch-type, repetitive calculation oriented workloads. These expensive computers were situated mainly in large companies, administered by substantial departments of skilled technical specialists. Users of computers were in the main unfamiliar with the technology and fully dependent on the technicians. Demand for computer services often outstripped supply significantly and chronically. The majority of systems were custom-built in-house, as there was no ready supply of applications packages for general business functions.

These characteristics of Data processing determined the framework for its management. And although updated to recognize some changes, the traditional information management model, as it is reflected in current management training and practice, is still based on these assumptions:

- its processes and structures are geared towards the large corporation/enterprise, with a
- predominance of custom development of application systems in-house, which in turn requires

- availability of large numbers of skilled staff who maintain systems which are mainly of the 'support' type (in the sense of McFarlan's 'categories of strategic relevance', McFarlan and McKenney, 1983).

Nolan *et al.* (1985), however, predicted that by the mid-1990s at most about a third of the information technology expenditure would be attributable to data processing of the type set out above. The management framework is thus in definite need of an upgrade and over the latter half of the 1980s a large body of research has been concerned with an evolutionary approach to adapting the management model (Earl, 1989). Given the more diverse nature of information technology versus straight data processing, an emerging addition to the management model is the inclusion of essential aspects of general technology management (McGee and Thomas, 1988), such as in engineering or main-stream research and development management.

Evolutionary change will not change the fundamentals of the management model. These may, however, have to change in line with general business thinking.

A paradigm shift in strategic management thinking?

Although some may claim that information management is not so much a framework than a body of 'tribal knowledge' (Wysocki and Young, 1990), the set of its methods and the code of good practices are clearly modelled on the broader tradition of general business (Cash *et al.*, 1988). As information technology moves ever closer into the business, this alignment changes from a mere convenience to becoming an imperative. It is thus right to assume that any changes in business thinking should directly affect the information management model.

The current strategic management paradigm of general business is shaped by the planning–doing-cycle. First, the enterprise determines what it wants to do (the 'end', to use terminology introduced by Hayes, 1985), then it specifies a strategy to get there (the 'ways') and lastly it develops a detailed strategic plan to marshall the necessary resources (the 'means') to carry it out. This planning phase is then followed by the execution of the plan. Execution is halted in regular intervals to allow changes to be taken into account. This re-planning culminates in a new plan, with a subsequent phase of working towards realization of this plan, and so on.

Oversimplifying somewhat in the interest of clarity, this 'ends–ways–means' paradigm implies three axiomatic assumptions:

- the environment provides the clues for what the firm has to do to maximize its returns; from those it can derive the correct strategic 'fit' of its reactions to the world; this in turn pre-supposes that the universe can be forecast and predicted sufficiently well so that a strategic fit can be distilled from it;
- the firm itself is inherently stable and will not change fundamentally over the planning horizon; 'static optimization' (Hayes, 1985) and regular planning intervals, usually once a year, are presumed adequate to allow appropriate reaction by the firm to changes affecting it;
- top management steers the enterprise much like a captain or a general; this 'command-and-control' (Hayes, 1985) thinking means that all directions are imposed on the organization from above and their execution monitored and enforced with an elaborate system of budgetary and other controls.

This paradigm, basically reactive in nature, has served business seemingly well until the last decade. Then it became obvious that the pace of change, not only economical but also political, together with a rapidly increasing number of market operators and the closeness of these markets in one 'global village' had made those basic assumptions untenable to a fair degree. Unpredictable sea changes in the environment made it impossible for firms to follow, particularly as they were handicapped by the massive bureaucracies needed for command-and-control. The stop-go method of following market clues together with the notions of permanently sustainable competitive advantages began to be questioned.

At first, adaptations to the cyclical model were felt sufficient to accommodate the new realities (Ansoff, 1982). This still left the basically reactive stance intact – the reaction was merely increased in sophistication. An analysis of different approaches, however, led to the discovery that a different style of management was notably more successful. There managers concentrate on declaring a 'strategic intent' to reach a clear 'vision' of how to shape the market rather than 'fit' in with it. They then proceed to strengthening the firm's means of reaching this end instead of just meticulously mapping out a course. This emerging theory of concentrating on the 'core competence' of an enterprise (Prahalad and Hamel, 1990) together with several other concurrent developments in general management thinking (Kanter, 1989) is increasingly, and profoundly, influencing the basic paradigm of strategic management. It re-formulates the basic three axioms differently:

- the firm adopts a fundamentally pro-active, and highly competitive stance: strategic intent on shaping the environment replaces the notion of reactively fitting in with the world (Hamel and Prahalad, 1991); the notion of 'benchmarking' (i.e. comparing the firm's performance and processes with that of the industry leader, or a friendly

competitor) is firmly replaced with the intent to outpace the other players;
- focusing on inherent strengths and competencies is a safer method to cope with the vagaries of an increasingly unpredictable universe;
- creating an organization which is flexible enough to cope with fast change (Drucker, 1988) and can maintain the skills and the readiness for continuous learning and improvement; this is seen as a better way to cope with change than stop/start, top-down planning (Senge, 1990).

This changed strategic management thinking has not yet been consolidated into a cohesive framework. It has also not yet penetrated into information technology management frameworks. The implications for information management together with a possible outline of an adapted model for IT is developed in the following section.

Towards a new information technology management model

It is firstly necessary to introduce a simple nomenclature for the main components and functions of the information technology management process[1] so that the adaptations suggested can be clearly demonstrated. This describes the functions of information technology management in four base activities:

- the plan function; this includes the strategic view of information technology management, and includes planning for technology as well as for systems (Rowbrey-Evans, 1991); by definition, this area is most affected by the change in strategic thinking;
- the buy function; this is management of the acquisition of application systems, including implementation and support;
- the make function; this is the management of the process of developing application systems, whether in-house or through external contractors;
- the run function, i.e. the day-to-day management of the information technology function in the enterprise; it includes operations/production management, applications management and technical support; this is no longer the sole reserve of the internal information systems specialists, but includes users and external ('facilities management') contractors; the notion of building and maintaining 'core competence' has a strong influence here.

In the following paragraphs the implications of the new management paradigm shift for each of these information technology management functions will be discussed.

The 'PLAN' function

The traditional model of strategic planning for information technology is a subset of, and dovetails into, corporate strategic planning. It too is characterized by a variation on the 'end-ways-means' theme: the 'end', the strategic end position, is derived from taking on the business' strategic objectives, identifying critical success factors to their achievement and lastly determining where there would be opportunities for information technology. After this alignment, the next step entails working out the 'ways' in which to transit from the current to the future desired state. This, in turn, determines the 'means', i.e. which level, type and intensity of information technology to plan for. Figure 1 shows the inter-relation between the enterprise and information management in the traditional management model.

The new strategic management substitutes this reactive strategic planning with statements of strategic intent, based on core competencies of the enterprise. Analogously, in the first instance, information technology management needs to determine how they support, complement, enhance, or, as is increasingly the case, create or potentially transform – 're-engineer' – the enterprise's core competencies.

As a framework suitable for the analysis of core competencies and to define the leverage points for information technology, Porter's value chain model (Porter and Millar, 1985) seems a suitable candidate. It should be used to carry out a thorough bottom-up analysis of the business

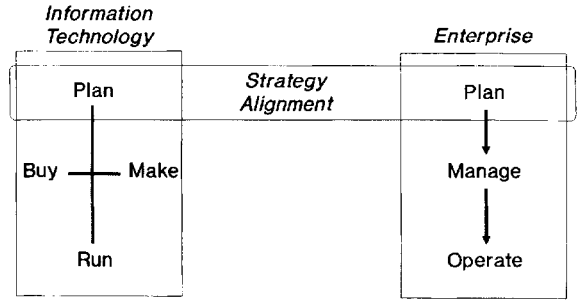

Figure 1 The traditional relationship of information management and enterprise

[1] There seems to be no accepted consensus among researchers about the nature of these main functions; a suitable and comprehensive summary of the traditional function set is given by Frenzel (1992: p. 8). This contains development, computer operations and technical support as well as systems planning. To conform with the notion of a 'business within a business', introduced by Richard Nolan (1982), but without going to the extent of the more elaborate organization Nolan prescribes for the typically big enterprise, Frenzel's functions were augmented as follows.

operations of the enterprise:

- identifying where core competencies are in relation to the value generated by the activities relying on them; and subsequently
- beginning with the core activities, re-engineering the operations with the use of information technology and identifying the information technology intensity of each core competence;
- thirdly, the role of information technology within the core competencies of the enterprise needs to be analysed for what corresponding core competencies are required from information management themselves;
- lastly, this process is iterative: information management's core competencies, once developed, will probably put an enhanced focus on the way in which core competencies of the enterprise can be re-engineered, which in turn will refine the understanding of information management's role, and so on.

The substitute for the 'strategic plan' is then a plan to create a central planning process to ensure that information technology occupies the place of maximum leverage with respect to the core competencies of the enterprise. The plan would have two parts, namely:

- projects for re-structuring processes now and in the immediate future;
- areas identified, and a process put in place for continuous improvement at both levels of core competence:
  - Assuring optimal leverage of the enterprise's competence by critically monitoring technology developments;
  - for information management this would be aimed towards achieving goals related to quality, e.g. zero-defects software generation in critical systems, etc.

Figure 2 depicts the mutual interdependency of enterprise and information technology via their core competencies.

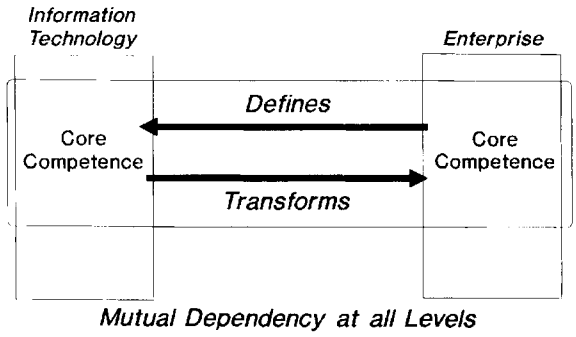

Figure 2 Coupling the core competencies of information management and the enterprise

The 'BUY' function

The high risk and the long lead times for in-house developed software seem to become less tenable in an environment where business undergoes rapid change.

The traditional management model, however, is based on the presumption of custom development by technical specialists as the norm and packaged software the exception. This needs adapting to the present reality which is characterized by a flood of pre-written software, especially for the mini and micro computer platforms. Information systems applications for general business functions (such as accounting, distribution and inventory control) are now considered 'commodity' (Hopper, 1990) software with a rich and fairly standardized functionality to fit a wide range of industries and businesses. This has made packaged software the norm in some areas. Table 1 overleaf shows an overview of general business functions (based on a table provided by Frenzel, 1992) together with application systems supporting them. For each application an indication is given, whether this would be available as a package and the degree of tailoring usually necessary.

This analysis shows that commodity systems cover a significant proportion of the basic business support required from information technology. There is a high percentage of applications where adjustments from a standard package will suffice. The area where full tailoring is required is relatively small.

The concentration of efforts on the 'core competencies' coupled with the need to be flexible puts heightened emphasis on selecting and making packaged software work. The management methods, however, appropriate to deal with the complexity of acquiring pre-written software are not yet well understood and therefore still ill-defined. In the following an overview is given of the four main issues a management model for dealing with pre-written software needs to address. They are about:

Requirements specification

Specifying application requirements in individual user interviews is too slow, too cumbersome and not precise enough; this process needs to be adapted depending on the type of package:

- the requirements for the 'commodity' type system are by now very well known and standardized, and their definition can easily be done with multiple choice questionnaires (available from most consultants) on a personal computer;
- defining the needs of a 'vertical' application is more complex. However, as they are derived from 'commodity' systems, it is possible to use the predefined standard requirements as the 'norm' upon

Table 1 Commodity applications and business functions

Function	Application systems	C/S/T[a]
Marketing	Marketing data bases	T
	decision support systems	T
Product development	Design automation/CAD	C
	part lists/catalogues	C
Manufacturing	Materials requirements planning and logistics	C
	factory automation	T
Distribution	Inventory control	C
	purchasing	C
	warehouse automation	T
	shipping/receiving	S
Sales	Sales productivity tools	S
	sales order entry and processing	C
	sales analysis	C
	commission accounting	C
Service	Call management	S
	assistance logistics	S
	site/failure analysis	S
Finance and accounting	Ledgers (general l., accounts payable/receivable)	C
	planning and modelling	S
Human resources	payroll	C
	personnel systems	S
	career development and manpower systems	T
Administration	Office automation	C

[a] commodity/some customizing needed/tailored.

which the specific industry requirements are defined by variation – still a faster and more accurate process than defining them from scratch;

- where the application is so specialized that, by definition, there is no standard requirement, then prototyping methods need to be used to improve upon the strictly verbal methods contained in the traditional model.

Assessing package fit

As software packages are becoming larger and more sophisticated, determining compliance with requirements is also becoming more difficult; equally, assuring the quality of the software is exceedingly non-trivial and varies significantly for the different types of packages; a full and comprehensive testing programme is often not feasible, because it simply takes too long; another solution, however, is to accept compliance with the more involved aspects of the system on trust from the supplier; this means that the relation between supplier and customer needs to go considerably further than the traditional contract basis of dealing with each other at arm's length; the nature of such alliances will be discussed in more detail below.

Implementing packages

This is different from implementing a custom written system, mainly because the logic of phasing in the software systems can be significantly different from the way in which the business processes themselves are structured; therefore the users need to take a significant role from the beginning.

Support

Selecting and establishing acceptable levels of support for packaged software is a multistage process:

- application support, advising on the right way to use the system can and should be carried out by the users themselves;
- first-line technical support, although preferable in-house, can also be supplied by an external source; this deals with diagnosing whether the systems work in the right way, making corrections using systems facilities and determining when there are problems with the software itself; it then becomes a case for
- system technical support for software fault-finding and fixing which most likely comes directly from the software supplier; using telesupport techniques (i.e. linking into a user's systems via telecommunication facilities and special software) makes it possible to provide such support internationally without local physical presence.

All of those issues are, however, also dependent on the type of package to be acquired. Apart from the 'commodity' packages, 'vertical' adaptations of the general packages (to suit the needs of a specific industry) are often readily available. For specialized business applications pre-written software is not always in a commercially packaged form: there are, in many instances, systems available which had been written by a firm in the same industry for its own use, and later offered for sale outside its own competitive environment to recover some of the development costs. Each type of package has its own set of specific management requirements.

The 'MAKE' function

The traditional Systems Development Life Cycle of establishing user requirements, translating them into software, testing to see whether the software indeed fulfils the requirements and finally the installation of the system

into the users' business requirement is fairly cumbersome. There is also some doubt whether the traditional model can cope with anything other than incremental change (Chandler, 1991).

However, it is not always necessary to have a fully customized system. It will be necessary whenever the enterprise is breaking new technological ground or if information technology is at the heart of the core competence. In most other cases it will be enough to create additional processing modules which interface with standard software. This is relatively crude in a technical sense, but the inelegance is balanced by lesser effort and the fact that cheaper, more powerful hardware can tolerate such inefficiencies. For practical reasons, such add-ons should be developed by the supplier of the original piece of software to maintain product guarantees.

Original development is often not frequent enough to make it feasible to employ large technical staff in-house. In-house staff also tend to be more involved in maintaining (repairing and enhancing) existing software. Large systems projects would thus take too long to complete with in-house staff. Third party development is therefore an essential component of the new management model for the development activity.

The essential component in the new management models thus has to do with the different ways of developing software, be it with in-house staff, from an arms-length supplier and where to set up a closer alliance with suppliers or even other, non-competing users. The establishment and the nurturing of these alliances – of varying degrees of closeness – is one of the key management skills in this area.

As more and more users have access to their own personal workstation, they will start developing – or wanting to develop – their own systems at an increasing rate. Using word processors, spreadsheets and databases, their efforts need to be encouraged, focused on the right techniques and controlled to ensure that their systems conform to minimum standards. Software quality management, including these end-user systems, is the other critical aspect for systems development, be it in-house or via third parties.

Given these considerations as a premise, a practical management model for the development function will most likely have the following key elements:

- the main area of development should not be the application systems, but first and foremost to set up a *technical infrastructure* for users' systems to work in;
- the infrastructure should be characterized by compliance with *open systems* standards to provide maximum flexibility for software and equipment changes;
- provision of a basic *client/server type network* for using computer aided co-operation, specifically in manufacturing, and group decision making for service and executive decision across different locations;
- facilitation of a *learning environment* where end-user system development can be fostered in a secure way, to ensure systems of consistent high quality.

The 'RUN' function

The running of application systems used to be the traditional core of the day-to-day management of information technology. More recently, the management of the corporate database was added and, following Richard Nolan's notion of the 'information technology business within the business', personnel management and general administration are also significant management activities.

As information technology is more and more disseminated to the users and as they are now running their own systems, production management tends to be refocused on the provision of technology services with the objective to ensure a 'transparent' infrastructure for the end-users. The custodianship of coporate data, now that direct access is possible for a much larger number, has gained importance.

These developments have sometimes led to a certain isolation of the 'technician' in charge of information technology, away from the mainstream of business development. On the other hand, not many of the end-users are yet at a stage where they could themselves take on the functional management of the technology they use. In order to close this gap education and training must be provided to ensure that users obtain a better functional understanding of information technology (what it can do for the business) and on the other hand, technical management need to acquire an appreciation in depth of what the enterprise's business is all about.[2]

The rapid uptake of information technology has led to an increasing sophistication and variety of technologies which need to be supported. This has meant that the corresponding demands on technical skills, in variety as well as in depth, have often outgrown the information technology department's in-house resources, for economical reasons and because they are not readily available. Attracting and holding technical talent is of particular concern for the smaller business. Smallness, on the other hand, is an important ingredient in the new strategic thinking.

The skills to mix internal with external resources while increasing the quality of services provided to users and the systemic use of third party suppliers, in a multiplicity of

[2] Recognizing this need and after much discussion in a special task force, the British Computer Society, together with the Henley Management Centre and Sheffield Polytechnic have prescribed a curriculum for a 'hybrid information technology manager', i.e. an MBA degree in Business and Information Systems.

roles, are at the heart of the new model for the day-to-day management of information technology. Candidate areas for external management are:

- operation of the central production machine for 'commodity' type applications – the *'utility' function*;
- *technical support* for the infra structure technology, i.e. the network of client/server stations in the enterprise as well as any wide-area networks under the enterprise's control;
- *development of customized software*, mainly for non-core applications; in specific, closer, alliances this may also cover the creation of core applications of information technology;
- *application software support* (technical support, providing first-line assistance as well as a supplier-role, software-fixing service).

There are a number of ways in which co-operation with an external supplier can be structured and managed. In America and Europe the traditional way is the contract-based, arm's-length relationship between customer and supplier. The contract is supposed to stipulate comprehensively the sum-total of both parties' obligations under a single, individual deal. This model has been found wanting as the deals became more complex and the dependence between the deal partners grew – the formulation of contracts to cover imponderable uncertainties is not always possible and the use of contracts to force parties to perform is being found rather limited.

Subsequently, interested parties started joint-venture projects and, particularly in manufacturing, closer relations such as 'preferred supplier' status were introduced. All had their fair share of problems, as had the next development, the notion of a strategic alliance (Lei and Slocum, 1991).

A very successful form of alliance, however, has its origins in the East: the Japanese *keiretsu* and the Korean *chaebol*. Both are very tight alliances, with cross-shareholdings between members a fairly common bond. This structure puts less emphasis on short-term profitability, encourages re-investment and is thus focused firmly on quality-based, long-term growth. They also tend to be centred around a powerful 'head' member. The origins of both types of consortia are in the development phases of countries, when co-operation, typically to master new developments, was found more beneficial than competition.

Most firms, even big ones, are in a state of development where information technology is concerned. Mastering the technology is therefore as important as the perhaps more glamorous notion of information technology as a competitive weapon. This, together with the operational requirement to manage mostly through external alliances, would make the formation of information technology *keiretsus* a sensible thing to consider.

The close relation between a number of suppliers (hardware, software, services) and their customers across different, non-competing industries would work well towards ensuring that an optimal balance between outsourcing of non-critical activities and strengthening essential, 'core competence' skills in-house can be struck for each member. Cross ownership within the *keiretsu* would provide a strong incentive for this form of consortium to concentrate on mutually beneficial objectives.

The functions of such an information technology *keiretsu* would include taking on such roles as:

- local *supplier/distributor* of software; this should include a 'brokerage' for sourcing and selecting international software;
- local *technical support* for software and focal point for the maintenance of the telesupport technology with the original supplier of international software;
- *hardware/technology supplier* and technical support for infrastructural systems and equipment (e.g. operating systems, wide area and local communication networks, etc.);
- development and implementation of software, i.e. the normal functions of a *software house*; specific emphasis would, however, be placed on
- education and training of application systems users and/or user/supporters, as well as the provision of ongoing *management education* for both technical and business management.

Such an information technology *keiretsu*, even where most of its members are small enterprises, would be of sufficient size to attract good technical people and hold them. Their multi-industry character would enable interdisciplinary and cross-business learning for the information technology professionals. On the other hand, the *keiretsu's* comprehensive coverage of a wide spectrum of mature and emerging technologies should foster accelerated absorption of the technology by business managers, who would be able to get intensive exposure to all aspects of information technology.

Table 2 summarizes the recommended shift ofemphasis from the traditional management of information technology to a new model.

Suggestions for further research

The areas most impacted by the paradigm shift in general business are the planning and the day-to-day management of information technology. Research should concentrate on:

- assessing the way in which core competence in the business relates to competencies in information technology – and vice versa;

Table 2 Traditional versus the new information management model

Function	Traditional model	New model
PLAN	Top-down strategic planning; End-ways-means philosophy;	Analysis of IT core competencies, defining IT's leverage for enterprise core competencies, bottom-up analysis of operations; fostering innovative use of technology among users
BUY	Systems development life cycle without the development elements	Special processes for assessing software fit and ensuring quality; managing the *keiretsu* role in package implementation and in ongoing technical support; training and setting up application support by end-users
MAKE	Systems development life cycle, mainly for in-house development projects	Managing the role of the *keiretsu* in developing software; assuring software quality; provision of fast development tools and the facilitation of end-user systems development
RUN	Production, technical support, data management and administration	Supply infrastructure service from a variety of internal sources and members of the *keiretsu*; fostering of 'hybrid' management staff for systems management roles in user areas

- investigating whether the value-chain approach is the most appropriate for analysing and defining core competencies;
- thinking through the economical, political and social corollaries of the notion of an information technology *keiretsu*;
- the additional emphasis onto the area of managing the acquisition of packaged software necessitates research into appropriate,new,methods of managing this process.

This is not to say that the 'Make' function is not in need of adaptation. There is, however, already an established body of research at work.

Conclusion

The current thinking on management theory is changing and this will impact information technology.

In part this impact will lead to critical re-examination of current management practices and to align them with the new business thinking. The most influence will be felt in the area of information technology planning. The character of the day-to-day management is also affected, mainly by an increased use of external agents in what will probably be new and innovative forms of alliance. The idea of an *information technology keiretsu* is used as an example of how such alliances could be structured.

A secondary, but probably more lasting consequence of the paradigm shift in strategic business thinking will be a change in role for information technology.

Primarily, the notion of core competence through information technology could well mean that it will be absorbed far more comprehensively into the operation and the running of the business than its present state of 'integration' indicates. Figure 3 illustrates the position of

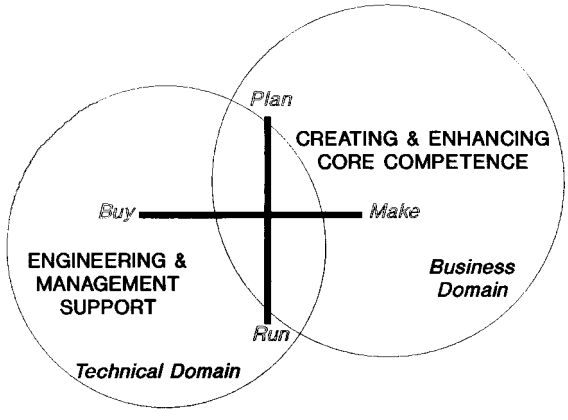

Figure 3 Information management linking business and technical domains

information management across user and technical domains. If core competencies are the engines of the enterprise, then it looks as if information technology is set to be acknowledged as the very fuel that fires them.

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