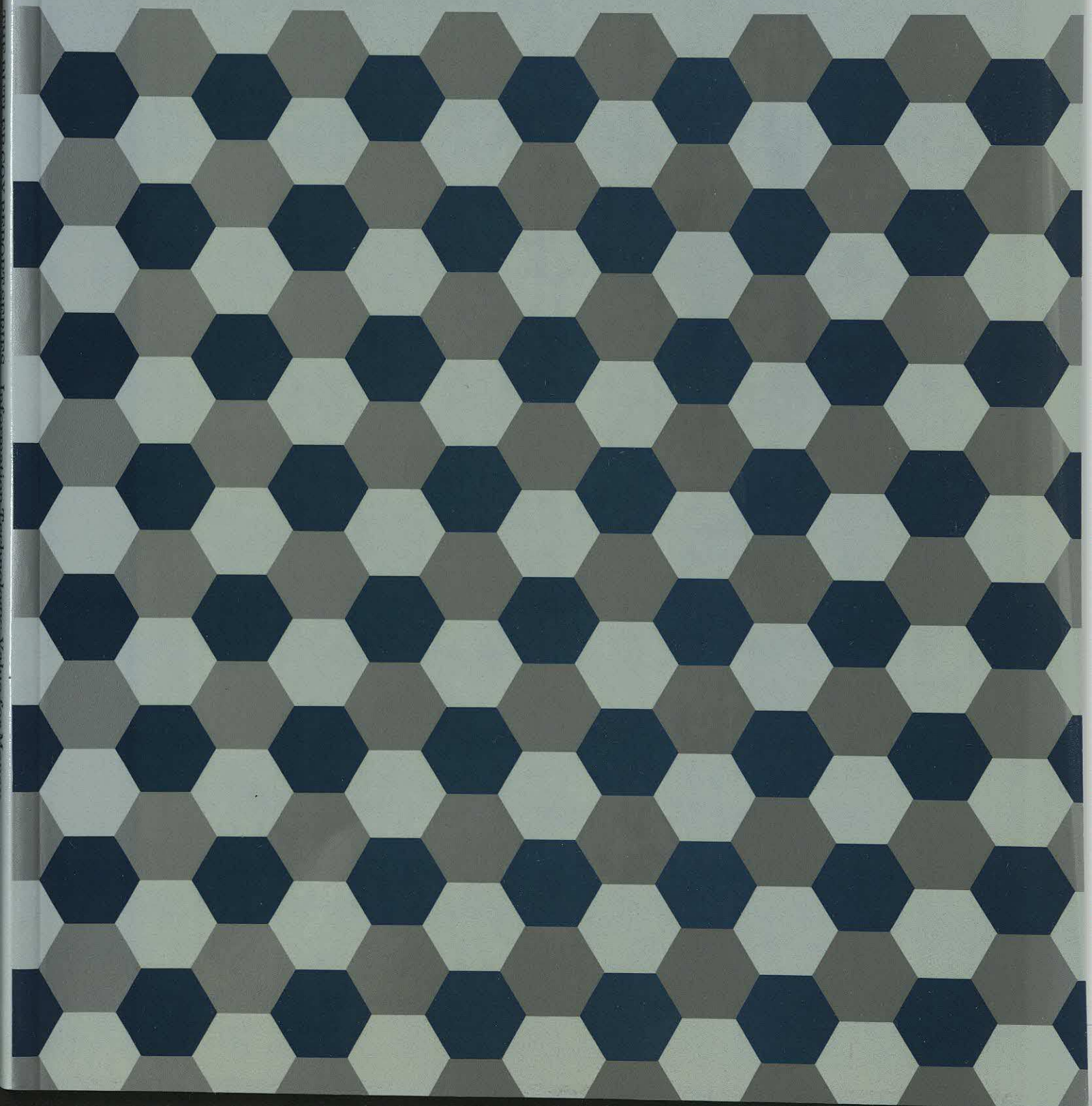
Information Technology: Value for Money

BUTLER COX



THE BUTLER COX REPORT SERIES

INFORMATION TECHNOLOGY: VALUE FOR MONEY

December 1986

Information technology (IT) is a major and growing area of investment for most organisations; without IT many could not operate their businesses. Getting value from that investment requires more than merely accepting the necessity of information technology. It requires understanding, assessing, directing and using the range of areas where IT can contribute to the improved performance and competitive position of the organisation.

The increasingly widespread use of IT, and in particular its growing role in supporting and advancing business objectives, demands a level of involvement from the senior managers responsible for it well beyond what was the norm even five years ago.

This report is a guide for senior managers responsible for ensuring that their organisations get the most from their investment in information technology. The titles of such managers will vary — Chief Executive, Finance Director, MIS Director — but their responsibility will normally be at board level. Other senior managers in business functions and managers responsible for the day-to-day management of information systems will also find most of the topics covered of considerable relevance to their objectives, as the report aims to present in a structured way those factors that contribute to the successful and profitable use of information technology.

METHODOLOGY

We have been extensively involved, in both our consulting and research activities, with management issues arising from the use of information technology. The practical experience and insights accumulated by us during nearly a decade of work with senior management on these issues represent an important input to this report. We have also drawn on the results of two European surveys and on case histories in both Europe and the United States:

- A survey of 70 senior managers, drawn from the largest 1000 companies in Europe, on their views and concerns about information technology, its use as a competitive weapon and the performance of their information systems departments.
- A survey of 80 information systems departments which includes an assessment of their current and planned levels of investment in information technology.
- An investigation of over 100 case histories of organisations on both sides of the Atlantic that are using information technology to gain a competitive advantage.

In addition, we describe our approach for planning an IT strategy, linked closely to business objectives.

DEFINITIONS

The report is written in a style designed for the non-technical reader. We use the term *information technology (IT)* to describe the technology and systems associated with the electronic processing and transmission of information. This includes hardware, software and telecommunications systems. In line with common usage, we use the term *information systems (IS) function* to refer to the organisational entity or entities responsible for the planning, development, use and support of information technology.

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Chapter 1

EXPENDITURE ON INFORMATION TECHNOLOGY AND CONCERNS OF SENIOR MANAGERS

"I think information technology contributes at least three per cent of our bottom-line profit margins. Operationally, we couldn't get through the week without the system support; and in the marketplace, I don't think we could hold our market share without the technology. But this is mainly a gut feeling. I can't back up these estimates with numbers or specific reasons."

This statement, by a divisional president of an American corporation, was quoted by Gregory L Parsons of Harvard University in the Sloan Management Review, Fall 1983.

In recent years the perceived status of information technology in many, perhaps most, enterprises has changed. In the past the systems function was regarded as a low-level exercise in record-keeping, the lineal descendent of the punchcard bureau, a mere economic alternative to keeping a small army of clerical workers, superior to them only in being cheaper, more reliable, and less prone to influenza. The role of the systems manager in the enterprise was consonant with the perceived status of the task. Many board members probably did not even know who the systems manager was. While this traditional role was irksome to the systems manager — who in most cases believed that systems had a huge, undiscovered potential for the good of the enterprise — it had the merit of being low-key and therefore low-risk. While the prizes available to the systems manager were limited by the lack of boardroom visibility he could command, so were the risks inherent in being more open to boardroom inspection.

In companies like the one referred to in the above quotation, the function of information systems has not only changed, but has been seen to change. Systems are now widely recognised as critical to company performance in areas like sales and marketing, product design and development, and flexible manufacturing. The systems function has come out of the back office and become part of the competitive arsenal of the enterprise.

Those same systems managers who had for years been seeking to command the attention of the board now witness an awakening of interest that amply rewards their missionary zeal. But every silver lining has a cloud. The new visibility afforded to systems is not an unmixed blessing for the systems manager. In areas they regard as important, boards are demanding of performance and unforgiving of failure. The system manager's low-risk, low-profile status is, little by little, being taken away from him. Like others in key roles, he must either perform or make way for someone else.

This process of change in effect adds to the responsibilities of the board. It extends the necessary horizon of the board to include an area of activity that is complex, technical, perfectionist, jargon-ridden, sometimes remote from the real world and always (apparently) short of the money, people and skills to do the job.

In this chapter we set the context for the report by reviewing common concerns among senior managers. We describe levels of expenditure on IT, taking a cautious view of the extent to which industry averages of such expenditure are a useful measure. We assess the growing role of IT as an important element in business strategy and review the role of IS departments, as perceived by senior managers.

LEVELS OF EXPENDITURE AND CORRELATION WITH SUCCESS

The need to ensure proper cost control in the systems function is one of the oldest preoccupations among senior management; indeed, it was *the* major concern during the 1960s and 1970s. Ideally, it is met by establishing a direct link between IT expenditure and business success. But proof of such a link is often hard to come by. More often, the belief that money spent on IT is money well spent, rests upon faith and conviction rather than solid evidence.

LEVELS OF EXPENDITURE

Levels of expenditure on IT are traditionally measured, and often allocated in budgets, as a percentage of the turnover of the organisation. It is often assumed that industry averages of such percentages may be used as a 'benchmark' against which individual organisations can compare their own levels of

expenditure with those of other organisations in the same industry sector, and judge whether it is 'right'.

Our survey of expenditure on IT of European IS departments provides such comparative data on both current and planned levels of investment.

In Figure 1.1 we provide annual figures on expenditure on IT as a percentage of turnover for various industry sectors showing that the average is 1.67 per cent across all sectors. Banks and insurance companies spend the largest proportion of turnover on IT. Average expenditure on IT was $8.9 million per organisation. This figure breaks down as shown in Figure 1.2 into various areas of expenditure. By far the most important item, accounting for nearly 40 per cent of the expenditure, is staff.

Nearly all the organisations surveyed were planning to increase their expenditure levels considerably over the next year. Average expected rise in expenditure was 16 per cent, with some individual organisations expecting an increase of up to 95 per cent. Figure 1.3 provides a breakdown by industry sector of expected growth in expenditure.

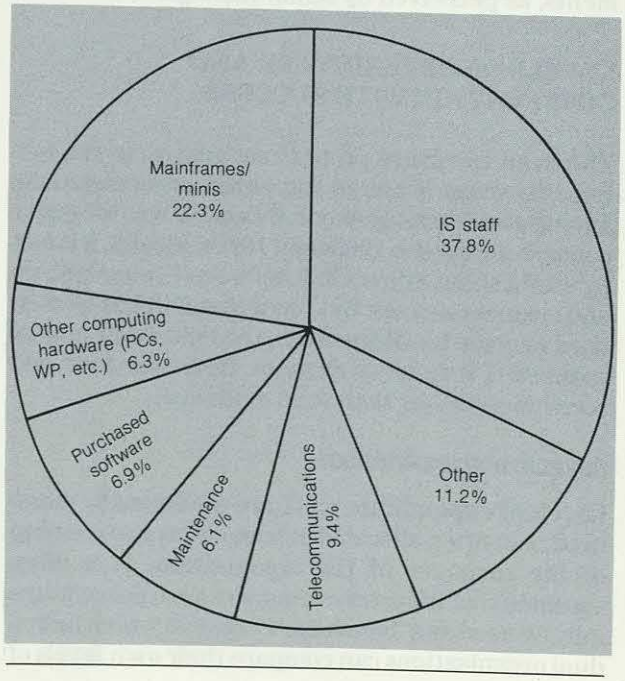
Figures such as these may sometimes be used by information systems departments to press for a higher allocation in company budgets, if the organisation's expenditure is below the industry norm; or they may be used by boards eager to cut cost, if the organisation's expenditure is above the norm. If an organisation's expenditure is roughly in line with that of others, management may be lulled into a perhaps false sense of security, derived from the knowledge that their organisation is 'average', and therefore likely to be on the right course as far as information technology is concerned. For this reason such figures need to be treated with some caution.

In our view, industry averages of expenditure on IT are interesting for comparative purposes at a very gross level, but should not be taken as more than that, because they tell nothing about what the organisations actually achieved for the money.

Figure 1.1 Expenditure on IT for various industry sectors (1985)

Industry sector	*Average % of turnover*
Manufacturing	
– Food and allied	1.26
– Engineering (including cars, electrical, electronics etc.)	1.31
– Other (including chemicals, oil, etc.)	1.11
Finance	
– Banking	3.46
– Insurance	2.09
Retail and distribution	1.01
Public sector (utilities and local government)	1.08
Average for all sectors	1.67

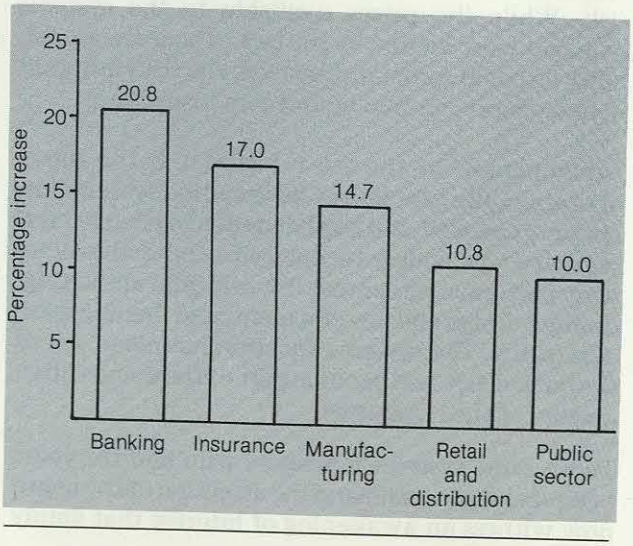
Figure 1.2 Breakdown of IT expenditure by area



CORRELATION WITH SUCCESS

Many researchers have tried to establish whether there is a correlation between degree of use of and expenditure on information technology, and success. At the anecdotal level, of course, evidence relating expenditure on IT to success abounds.

Figure 1.3 Anticipated increase in IT expenditure, by industry sector



Unfortunately, such cases are by nature highly selective and therefore highly biased. At the level of formal surveys based on statistically reliable samples, the results are, at best, mixed because there are definitional and practical difficulties in establishing such a correlation. Furthermore, there is the plain commonsense question of what correlation actually means.

It is not easy to define what constitutes success: for some organisations it will be higher profits; for others, user or management satisfaction; for yet others, securing a new market or even merely surviving in an old one. What constitutes success is therefore intimately related to the organisation's objectives and these objectives will differ not only from organisation to organisation, but from time to time for the same organisation.

There are also practical difficulties in establishing a valid correlation. It would prove little to measure correlation between, say, level of expenditure and profitability in any one year. Many organisations now treat IT as an investment rather than another item of expenditure (see Figure 1.4), and rules and timeframes for calculating return on investment vary between organisations. Individual tracking of organisations will therefore be necessary over a number of years, and this is likely to be subject to changing success criteria, accounting procedures and new priorities for both the organisation and its information technology resources. Taken together with other difficulties in constructing a valid sample, it is not possible to arrive at reliable conclusions from such studies, for purely practical reasons.

Perhaps the most important point is that correlation would not necessarily prove anything, even if all these difficulties could be overcome. If there were a positive correlation between, say, levels of expenditure and profitability, it could well be argued that the more profitable companies simply have more money to spend on information technology than those that are less profitable. A statistical correlation proves nothing more than correlation; it cannot be used to prove what is cause and what is effect.

We illustrate these points with three examples:

In a study of 138 wholesalers in the United States, the researchers investigated the correlation between degree of use of computers and return on assets. They went to some lengths to ensure that the sample was statistically valid. The results (see Figure 1.5) indicated that heavy users of computers showed a lower return on assets than medium-level users or non users. However, deeper analyses revealed that of the heavy users 30 per cent showed a high return on assets — the average was depressed because so many other companies in the high-user sample performed so poorly.

In another study, Hubert Heyvaert, a professor at a Belgian university, investigated 120 companies (all but eight were Belgian) in a study for the Belgian government that included a range of topics, including investment in IT. The review period covered 15 years' return on investment.

The study team expected to find a range of positive correlations; in fact, they found none, to their great astonishment. To quote Professor Heyvaert: "What explained success, apparently, is that success is the output of a good decision, and a good decision is the output of a good information system". Specifically, Professor Heyvaert and his team identified three differences between effective and ineffective organisations in terms of their use of IT. Effective organisations had:

Figure 1.4 Organisations treating IT as an investment or expenditure

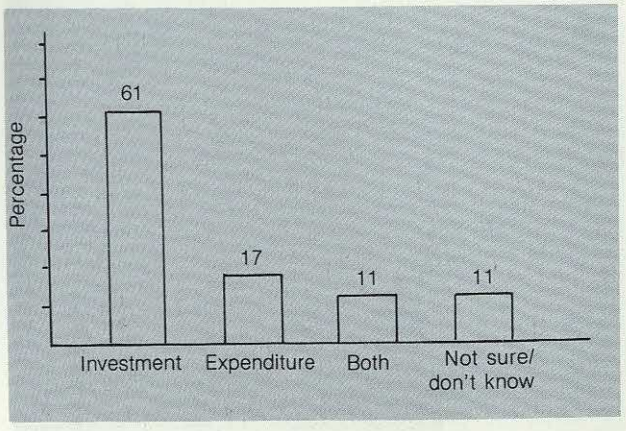
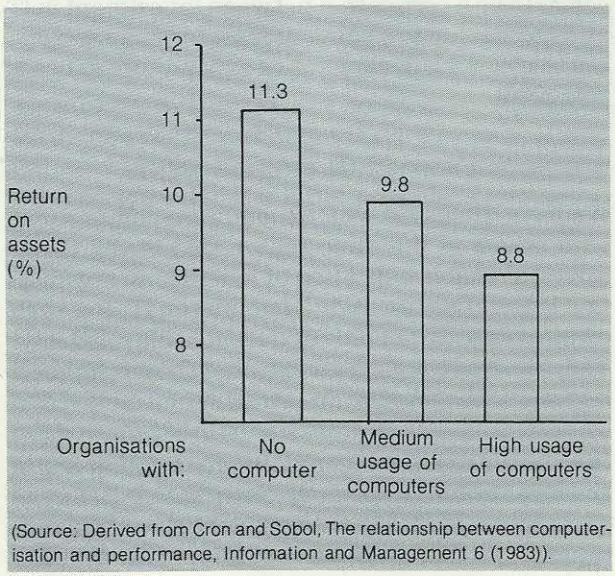


Figure 1.5 Return on assets related to degree of computerisation



(Source: Derived from Cron and Sobol, The relationship between computerisation and performance, Information and Management 6 (1983)).

— Good internal systems.

— Good sources of external information.

— Good communication channels and systems.

As part of our survey of IT expenditure, we correlated level of expenditure as a percentage of turnover with levels of satisfaction, 'satisfaction' being measured using a set of composite factors, each of which the participating organisations were asked to rate. Some interesting results emerged, although, overall, for all sectors, no obvious correlation was found.

However, when broken down into industry sectors, a positive correlation between expenditure and success was distinguishable for the manufacturing and the retail and distribution sectors (see Figures 1.6 and 1.7). Interestingly, the correlation is not a straight-line one; instead it levels off and declines slightly as expenditure rises. We found no correlation for the banking and insurance sector. However, for the public sector (comprising utilities, local authorities and nationalised industries such as transport) we found a slight negative correlation (see Figure 1.8). On the whole such organisations place, rightly or wrongly, much greater importance on criteria such as improved efficiency and lower costs than their counterparts in the private sector. At the same time, they experience a variety of pressures similar in many respects to those in the commercial world (eg pressures to provide better service, competition between different types of utility, etc), which encourage higher expenditure on IT. Given these conflicting pressures, a negative correlation in this sector is perhaps not as surprising or as significant as it may seem at first.

Overall, the results of our survey, (although we believe they are subject to some of the caveats given at the beginning of this section) indicate that there seems to be a correlation between investment in IT and success 'up to a point' at least for some sectors, but that success declines once expenditure exceeds that point.

IS THERE A 'RIGHT' LEVEL OF INVESTMENT?

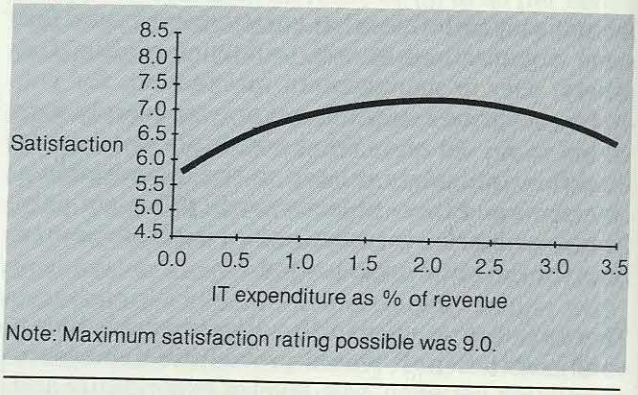
We have discussed why expenditure comparisons with others in the same sector are not, by themselves, a reliable indication of whether an organisation is spending the 'right' amounts on IT. But such comparisons are not only of questionable reliability. They also cause organisations to ask the wrong question about the level of investment.

We illustrate this in Figure 1.9: Organisation A is in the same industry sector as organisation B, but its expenditure on IT is lower, and well below the industry average. The question that is typically asked in such a case is:

"Are we in the right place?"

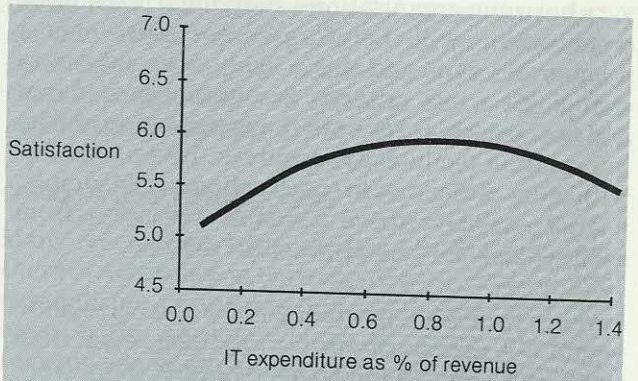
This, we believe, is the wrong question to ask. For any given level of investment an organisation gets a given level of benefits. The curve indicated by a solid

Figure 1.6 Correlation between level of IT expenditure and satisfaction with performance for manufacturing organisations



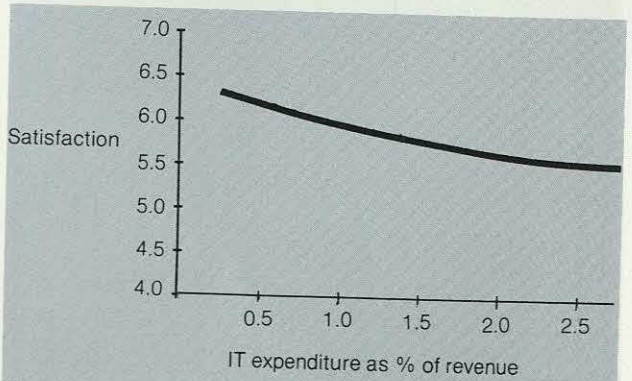
Note: Maximum satisfaction rating possible was 9.0.

Figure 1.7 Correlation between level of IT expenditure and satisfaction with performance for organisations in retailing and distribution



Note: Maximum satisfaction rating possible was 9.0.

Figure 1.8 Correlation between level of IT expenditure and satisfaction with performance for public sector organisations



Note: Maximum satisfaction rating possible was 9.0.

line in Figure 1.9 represents the 'ideal' level of benefits that may be achieved with IT for a given cost. We emphasise that this curve is a generalised one. (In practice it might be exponential, S-shaped or have some other shape). But for the purposes of our discussion here, the point is that few organisations reach this level at any one time. Firstly, because the level of both benefits and costs change over time — today's large investment may take years before it delivers substantial benefits. Furthermore organisations also differ in how well they choose systems and in how well they run them. The level of benefit obtained in relation to the level of investment is therefore not a function of just one factor, but several, of which the most important are:

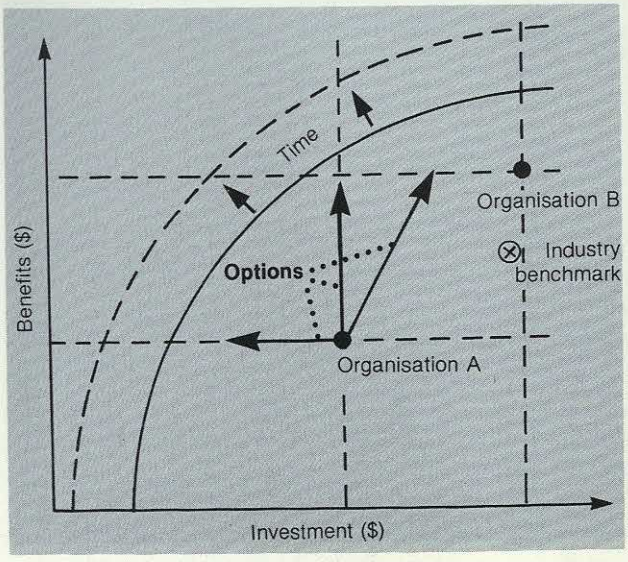
- The level of investment.
- The time when investment started.
- The systems and applications chosen.
- How well information systems are run.

Therefore the right question for an organisation wishing to maximise the benefits it obtains from its IT investment should be:

"In which direction should we move next?
Should we aim to obtain a higher level of benefit faster, with a higher level of investment? Or should we aim to obtain a higher level of benefits with the same level of investment as now? Or aim to obtain the same level of benefit as now, but with lower investment?" (A fourth possibility, lower levels of benefits for lower investment is rarely encountered in practice).

These questions are the essence of strategy. Much of what we discuss in this report emphasises the need for a strategy for IT. A strategy defines the objectives for IT and establishes measures by which its success can be determined. Therefore, unless an organisation has a strategy, it cannot adequately measure its success with IT. However, as we discuss in the next section, the ways in which IT is used to further the strategic objectives of an organisation are changing fundamentally.

Figure 1.9 Options for directing IT investment



THE USE OF INFORMATION TECHNOLOGY AS A STRATEGIC RESOURCE

One of the main reasons why senior managers find it difficult to assess the value they get from their IT investment is that in recent years the emphasis has moved away from using IT to reduce costs. It is much easier to prove a direct relationship between the cost of IT and the benefits obtained when cost reduction is the purpose of IT expenditure, than when IT is used to expand the business or to position an organisation in a new market. It is not that reducing costs is no longer important, because it is as much as ever. It is that management is recognising that IT is a tool that can be used in pursuing their strategic business objectives, of which cost reduction may be one, but only one.

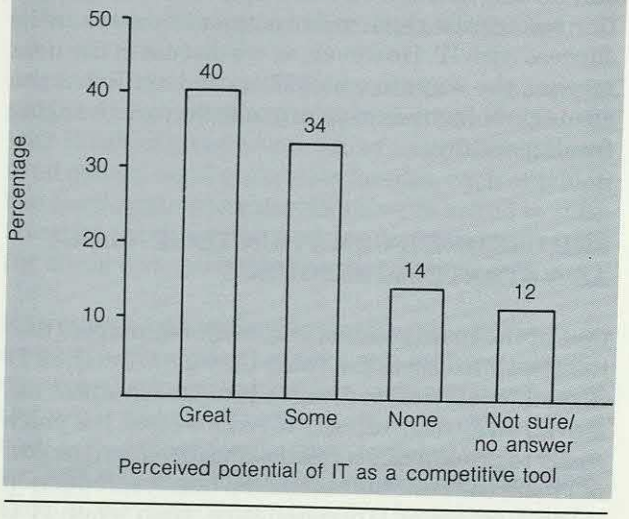
For example, say a tour operator adopts as a strategic business objective an increase in sales from travel agent bookings (as opposed to direct bookings) and uses IT as a means of achieving that objective. Success or failure of that strategy cannot be solely or directly attributed to IT, even if the largest investment associated with that strategy is in IT. IT may well be a prerequisite for success, but it is not the only one.

The issue is a central one, since the use of IT as a strategic resource to maintain or improve competitiveness is increasing. In our survey of senior managers of some of Europe's largest companies, 40 per cent believed that there was great potential for their organisations to use IT as a competitive tool and a further 34 per cent thought there was some potential (see Figure 1.10 overleaf). Many of these managers recognised that it is not possible to perform — and hence demand — conventional cost-benefit analyses for such purposes.

THE PROBLEM OF JUSTIFYING EXPENDITURE

Because senior managers recognise that cost reduction is only one of the ways in which an organisation can become more competitive and because there is, in any event, a limit to the extent to which costs can be reduced, businesses have turned their attention to using IT to increase their sales. A direct relationship between IT and higher sales is difficult to prove, however.

Figure 1.10 The potential for using IT as a competitive tool — senior managers' view



We illustrate this in Figure 1.11. The overall objective of any commercial organisation is higher profits. There are essentially only two ways of achieving that objective — more revenue or lower costs.

In terms of overall strategies for deploying IT within organisations to achieve this, we believe that there are essentially three stages:

1. Cost replacement, where IT is used simply as a means of processing information more cheaply. IT is used to replace costs associated with manpower, paperwork, overheads etc.
2. Increased efficiency, where IT resources are used to improve the operational efficiency of the organisation. The emphasis is on productivity.
3. More sales, where the explicit purpose of IT is to increase the volume of business.

These three stages follow a developmental path, as shown in the figure, through which organisations follow over time. They reflect the degree to which organisations look outward in terms of the contribution expected from IT. We believe that most organisations are now in stage 2 or in the transition between stages 2 and 3, as the possibilities for replacing costs and improving efficiency are being exhausted in many organisations.

Although the potential to use IT to increase revenues is not limited in the same way as is its potential to reduce costs, the difficulty most organisations have is in cost-justifying and assessing quantitatively the contribution from IT.

The difficulties are illustrated with examples in Figures 1.12 and 1.13. Figure 1.12 shows an example of an organisation whose strategic business objective is to aim for a richer, more up-market customer base, thereby increasing the value of each sale. To achieve this, it needs to change the way business is done in several areas (we have shown only some of them in the figure). IT may be used to greater or lesser extent (or not at all) in each of these areas. IT and the areas themselves impact and cross-impact each other. External factors also have a considerable and often unpredictable influence. As a consequence, the higher up the objectives hierarchy in the schematic, the more difficult it is to establish a direct relationship between the impact of IT and the achievement of these objectives.

By contrast, the impact of IT on reducing costs is much more direct (see Figure 1.13), even if different

Figure 1.11 Different IT strategies and the difficulty of performing cost-benefit analyses

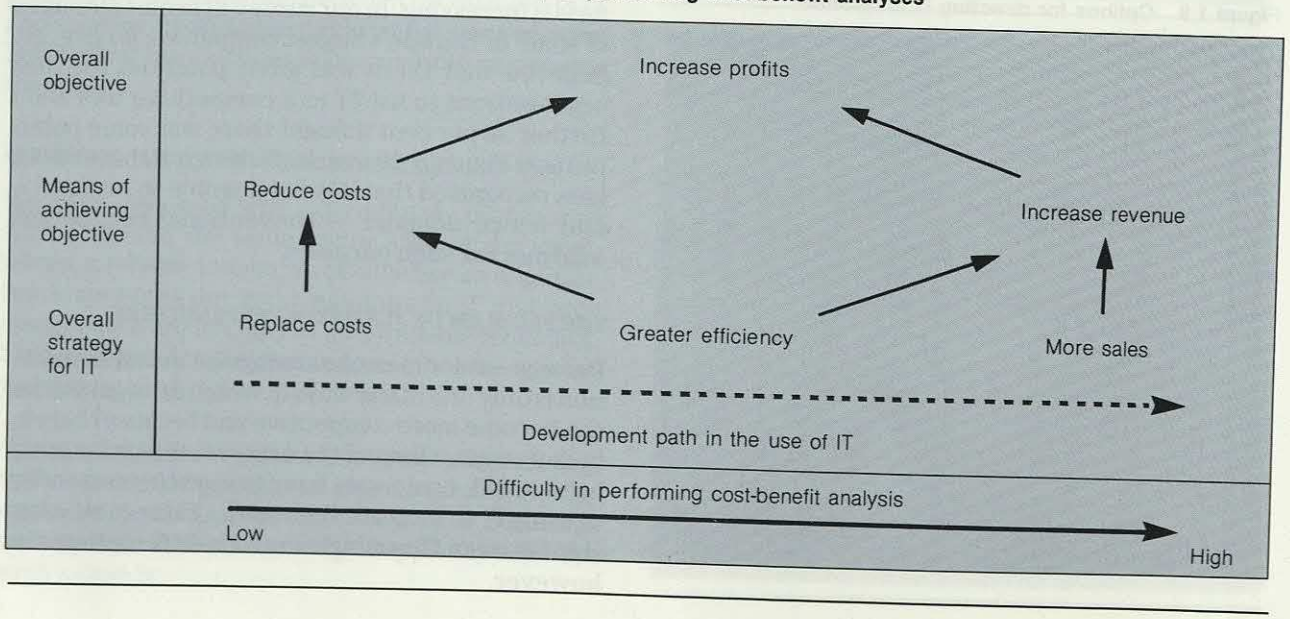


Figure 1.12 An example of assessing the contribution of IT in increasing revenues

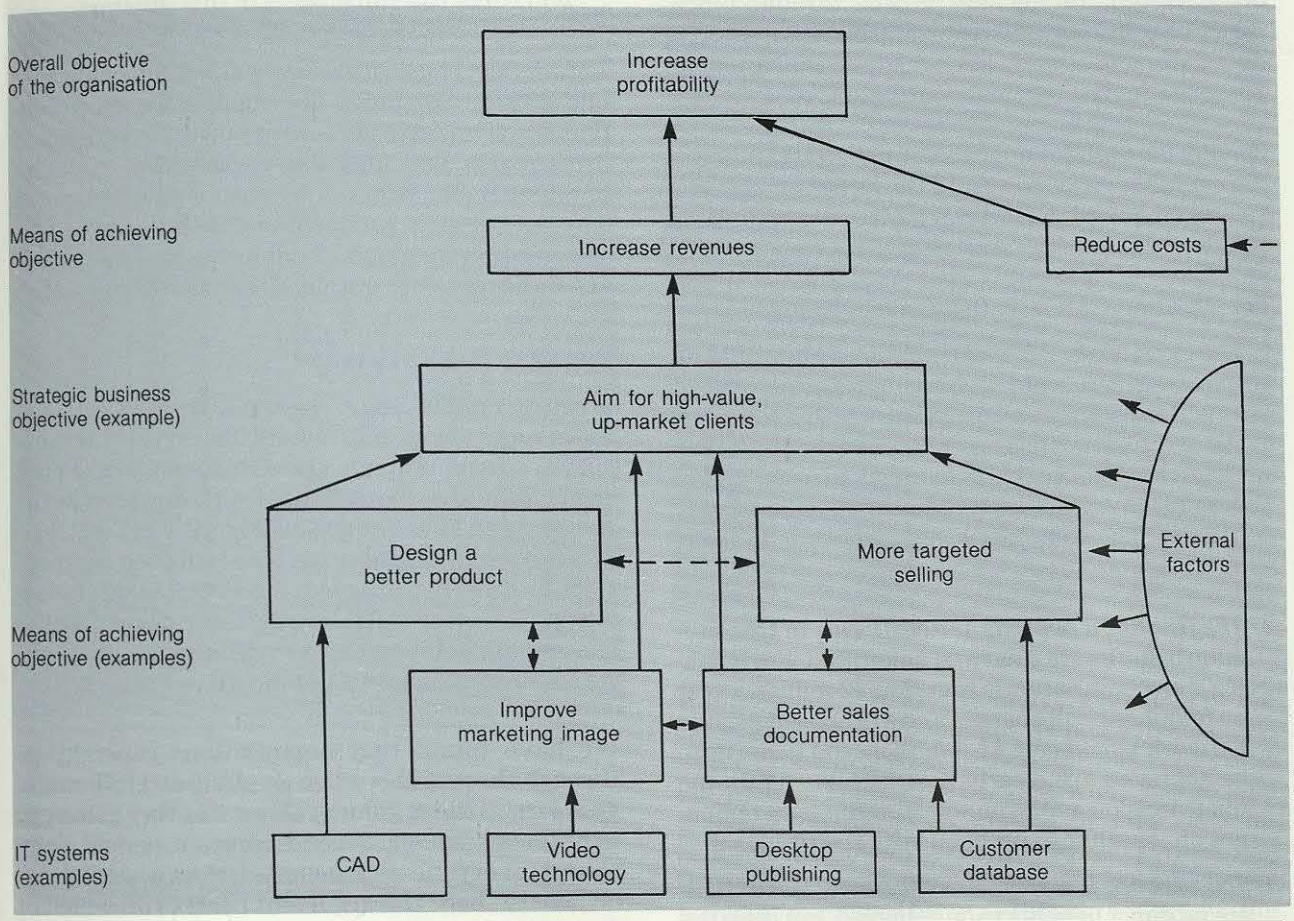
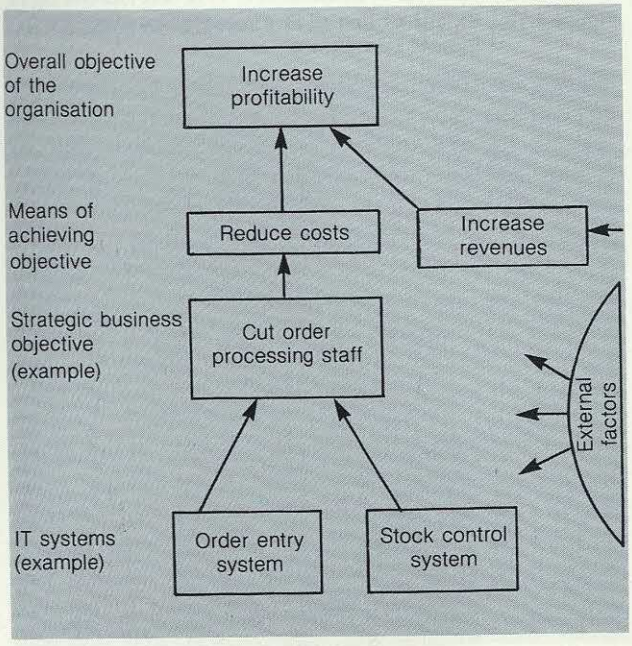


Figure 1.13 An example of assessing the contribution of IT to reducing costs



IT systems are used to achieve the objective of, in this example, cutting costs in the order-processing area. There will normally also be fewer external factors, factors outside the control of the organisation.

Therefore, where IT is used with the objective of generating more sales, it is necessary to break down the overall objective to be achieved into subordinate objectives, to as many levels as necessary to assess the impact of the technology and cost-justify it. The lower down the hierarchy, the easier it will be to measure the relationship. What is not possible is to demonstrate conclusively that any improvements at these lower levels are directly related to improvements at the strategic level.

Despite this, we believe that establishing causal links up the hierarchy of objectives is a worthwhile discipline that focuses attention on the actual business contribution of the technology and the way in which it is used to achieve that contribution.

IS A FULL INVESTMENT APPRAISAL ALWAYS NECESSARY?

In our experience many organisations enforce standard procedures for conducting cost-benefit analyses of proposed new IT investment, not recognising

that different situations demand different appraisal procedures. As a consequence, management time is often wasted, forcing new projects through procedures that are either irrelevant because the real decisions have already been made or that are inappropriate for the particular situation.

For any investment appraisal, an understanding of the overall level of costs and the different cost elements is required. It is with regard to the benefits to be achieved that appraisal situations vary.

The situations can be categorised as follows:

1. *The expenditure is unavoidable.* This would be the case where legislative changes are introduced or where competitive pressures are so strong that the organisation has no choice but to invest. For example a retail bank cannot survive today without investing in automatic teller machines (ATMs). The decision is not 'whether to', but 'how to' invest.

2. *The financial benefits are clear-cut.* In this situation benefits are clear and quantified. For example if an organisation is spending $2 million a year on telephone call charges and a proposed private network would cost $1.5 million, the benefits to be achieved are clearly worthwhile. Again the 'real' decision will be on selecting the right option, not on whether to proceed with the proposal.

3. *The expense is a form of insurance.* Here there are no direct benefits to be achieved, but, as is the case with any insurance payment, the cost of not spending could be very high. Installing systems to prevent security breaches and sabotage is a classic way of investing in 'insurance'.

4. *The expense of a formal appraisal outweighs the cost of the proposed investment.* Some investment proposals are so small in relation to likely benefits, that they simply do not warrant the management time and effort required for a full appraisal procedure. This is often reflected in the way in which authorised expenditure levels are allocated to managers at different levels. A word of warning, however: where the proposed level of investment is small, but likely to be the first of many similar such proposals, the organisation may be storing problems for the future. This has often been the case with proliferating and incompatible personal computers and office systems. Under these circumstances, the organisation needs to lay down clear, but overall, policies under which the individual proposals can be assessed.

5. *The expected benefits are large but not reliably quantifiable.* Several of the competitive-advantage applications we discuss in the next chapter fall in this category. Risk analysis can be of help by identifying those items whose variance has a significant effect on the outcome of the decision. Ultimately, however, management judgement will carry the full burden in this situation.

In practice, some situations will not fall neatly into one of these categories. For example an expenditure that is unavoidable because of powerful competitive forces, also provides the opportunity to obtain unquantifiable benefits by responding in a novel way, and often at marginal cost to those forces. The organisation then uses IT not just as an unavoidable expenditure to be contained, but as a strategic tool.

THE NEED FOR A STRATEGY

Much of our discussion illustrates the importance of a strategy in assessing the contribution of IT. Yet our survey of senior managers of Europe's largest companies indicates that a third of such organisations do not have an IT strategy (see Figure 1.14). Furthermore, questioning of those who said their organisations had an IT strategy revealed that some of these 'strategies' were little more than general policy statements or budgetary provisions. The time horizon of IT strategies was as shown in Figure 1.15.

We have found that organisations generally go through three stages when thinking about IT strategies. First is the argument about whether a strategy is necessary at all. Second comes a period when almost everyone is convinced that a strategy is necessary; here the argument centres on which of the available tools — eg IBM's Business System Planning, Alloway's User Needs Survey, Rockart's Critical Success Factors — should be used.

Figure 1.14 Extent of use of IT strategies by Europe's largest companies

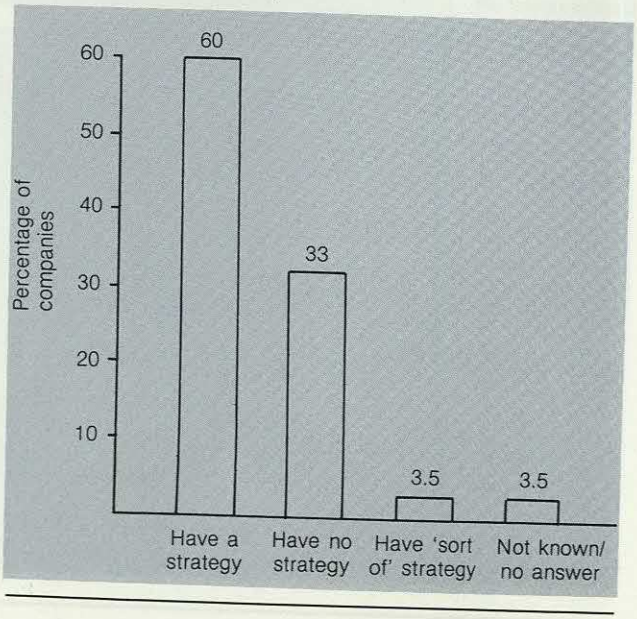


Figure 1.15 Time horizons of IT strategies

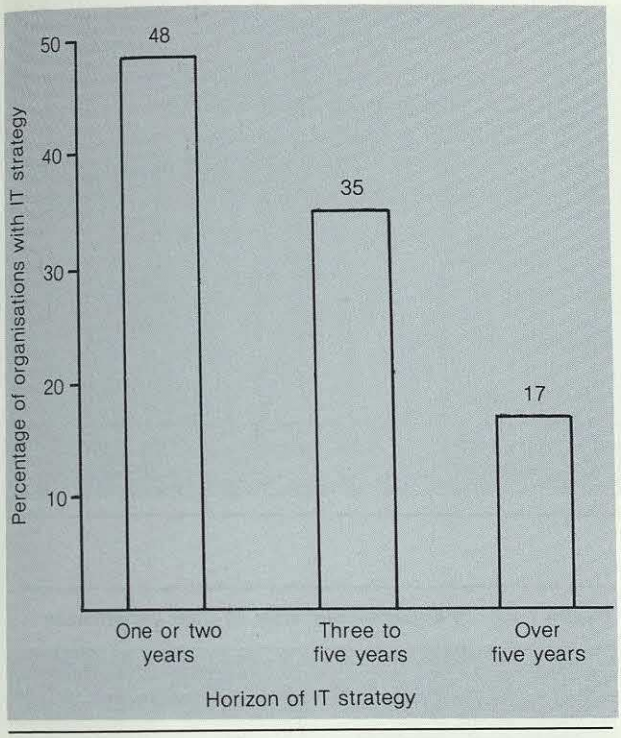
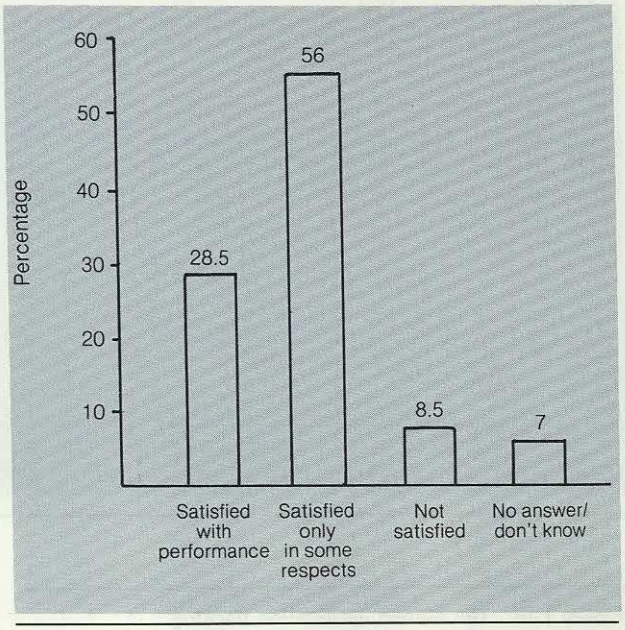


Figure 1.16 Senior managers' view of their IS departments



In the third phase it is recognised that such tools are necessary but not sufficient to make a strategy work. Management must also pay more attention to the political and human tasks.

We describe in Chapter 3 our approach for planning a strategy linked to business objectives, that takes these factors into account.

THE ROLE OF INFORMATION SYSTEMS DEPARTMENTS

It normally falls on the information systems department to implement strategies and run most of the IT systems in the organisation. Organising such departments to ensure that organisations get value is a major and important concern of managers. We have shown in Figure 1.2 (page 2) that the cost of people is by far the most significant single item of IT expenditure. Most of this cost will be incurred by the information systems department. However, given the growing level of use of IT by end users, some costs will often be hidden and not easily ascertainable.

We show in Figure 1.16 that less than a third of senior managers in our survey were fully satisfied with the performance of their systems departments; well over half were satisfied with the performance in some respects only; and nearly one in ten was not satisfied at all. The most common complaint is that of late delivery, and responsiveness to user needs comes a close second (see Figure 1.17 overleaf).

The problem of delays in delivering is one of the oldest in information systems. What has compounded the problem is what Dr Bob Alloway refers to as the 'hidden' application backlog, which has become especially acute as computing by end users increases. The hidden backlog is defined as those systems which users would like to have, but which they have not requested because they do not believe the request could be met.

The companies surveyed by Dr. Alloway in his investigation of the 'hidden' application backlog were shown to have a 'standard' application backlog equivalent to twice the volume of systems installed in manpower terms. The 'hidden' backlog was three times the volume of installed systems (see Figure 1.18 overleaf). Since the average known backlog is about two years, the hidden backlog is worth another three years' effort — a total of five years. So it is perhaps not surprising that systems departments feel under siege.

There is a further dimension to the 'backlog' problem. Considerable effort is often expended in modifying and extending old systems because of the huge past investment they represent. This works, but at considerable additional cost. Therefore the real backlog in some organisations is the need to replace these systems.

The problem of responsiveness identified by the managers in our survey is also a two-sided one, and one over which top managers can exercise control if they seize the reins of information technology. In a study conducted by Butler Cox, we asked system

Figure 1.17 Senior managers' concerns about their IS departments

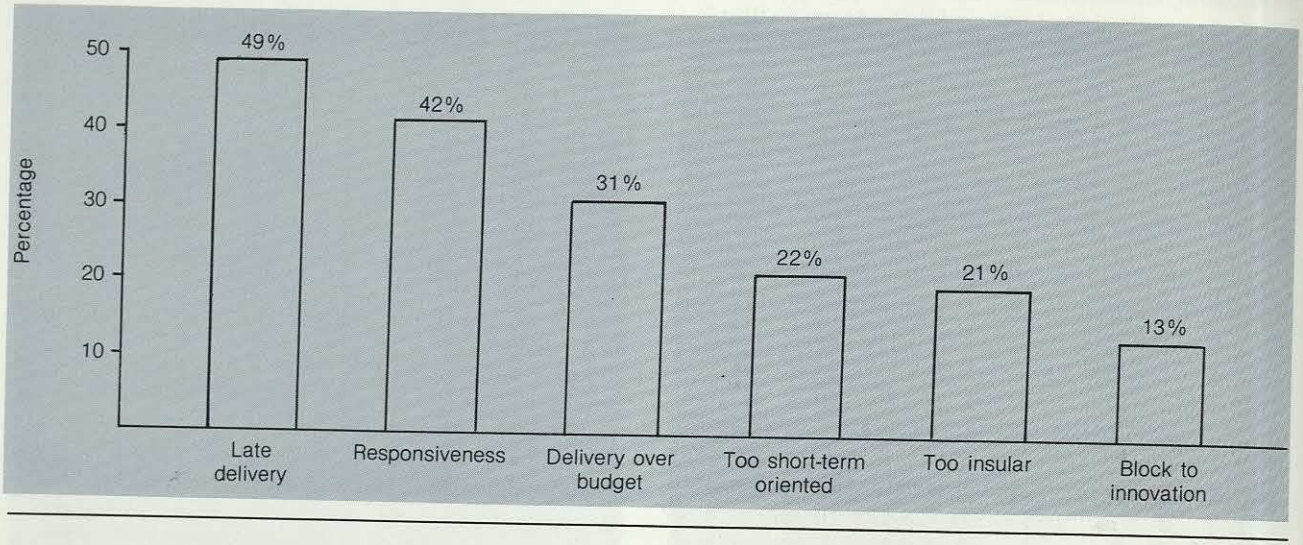


Figure 1.18 The hidden application backlog

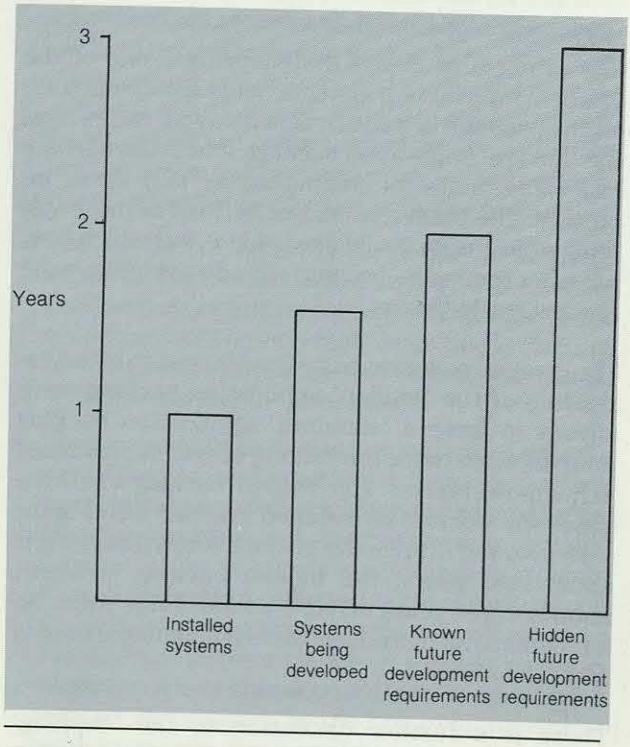


Figure 1.19 IS departments' view of their performance

Performance of IS department, compared with other departments	*Degree of improvement necessary*		
	Little or none	*Some*	*Great*
Below average			
Recognition by top management			✓
Contributing to company policy/strategy			✓
Influencing policy decisions			✓
Conforming to company culture	✓		
Average			
Investment plans readily accepted		✓	
Understanding of company's objectives		✓	
Adapting to changes in company plans		✓	
Above average			
Being asked for advice by others	✓		
Working together with other departments		✓	

managers to rate the degree of improvement necessary in their performance compared with other departments. The results, shown in Figure 1.19 indicate quite clearly that IS departments feel remote from top management and company strategy.

Bridging that gap between top management and the information systems function is essential for any successful IT strategy. It is clear to us from both our research and our consulting experience that the organisation of the systems function, the relationships it has with end users and top management, and, last but not least, the personal characteristics of the individual heading up the systems function are crucial to getting value from information technology.

CHAPTER 1 EXPENDITURE ON INFORMATION TECHNOLOGY AND CONCERNS OF SENIOR MANAGERS

SUMMARY

High and growing levels of expenditure have raised management's awareness of the need to regard information technology as an integral part of their business strategy. It is not a question of needing IT to conduct the business — most businesses would certainly not survive without IT. It is a question of getting full value for money from the investment made, by exploiting IT as a tool to improve the market position of the organisation, by linking strategies to business objectives, and by creating the right organisational mechanisms to ensure the benefits sought are delivered. The following chapters address these issues. They will address them not necessarily by providing a specific recommendation on every point but by describing and analysing best current practices in managing IT for better business results.

Chapter 2

USING INFORMATION TECHNOLOGY TO IMPROVE THE ORGANISATION'S COMPETITIVE POSITION

Most organisations recognise that in the past few years information systems have emerged from the back office and become part of the competitive armoury. The growing emphasis is on looking to the future, to performance in the market and to business success.

At the same time many managers we have talked to in our research have expressed considerable scepticism about the concept of using IT for competitive advantage. "After all, IT has been used for competitive advantage purposes ever since it was invented. So what's new?" is a typical comment. Some felt that the concept was oversold and was likely to be little more than a marketing ploy devised by IT suppliers intent on finding new ways of selling their products.

It is true of course that information technology has long been used to help organisations get the better of their competitors. However, while we agree that the phrase 'IT for competitive edge' has become something of a cliché, it is short-sighted and even dangerous for any organisation to ignore the new ways in which information technology is increasingly used to secure, maintain and improve the organisation's competitive position.

The main reasons why information technology has emerged from the 'back room' have less to do with the technology, which has mostly been available for years, than with trends that have made the wider application of the technology more feasible:

- Better designed IT products that enable non-experts to use the technology easily.
- Better national and international communications infrastructures.
- Lower costs of the technology.
- Deregulation of monopolies in a growing number of sectors.
- Standardisation, especially the development of industry standards.
- Increasingly intense competition in some industry sectors.

Different researchers have used different terminology to describe the kind of systems that support competitive advantage. Michael Hammer calls them "Type-3 Systems", Scott Morton calls them Decision Support Systems. It is not our aim in this chapter to cover anew the well-researched territory of what is meant by these terms. Instead we deal with the purely practical question of how such money-earning applications are found and developed. Where do they come from? Can we learn from the experience of companies that have successfully developed them? What are the potential pitfalls?

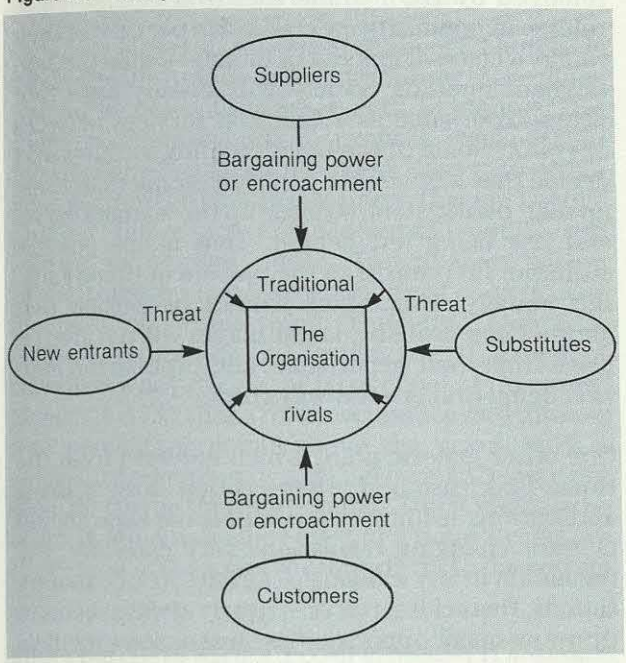
COMPETITIVE FORCES

Applications of information technology that can lead to competitive advantage come in several flavours. There is not just one way of leaving the competition behind. Michael Porter, whose work in the field of competitive advantage is well known, identifies five forces that influence a business's competitive stance (see Figure 2.1). The first is the activities of traditional rivals — what is usually referred to rather loosely as 'the competition'. The second is the bargaining power of suppliers, who may try to reduce the organisation's margins or may even try to encroach upon its business. The third is the bargaining power of customers, both on price and business territory. The fourth is the threat of new entrants to the market, and the fifth and last is the threat of products or services that substitute for those provided by the organisation.

The impact of information systems is particularly clear in the area where customers or suppliers may challenge for a share of an organisation's business. For example, the banks in Britain today are keenly aware that as EFTPOS becomes more widespread, so the major retailers (in the past among the banks' most important customers) secure control over huge cash flows, in effect becoming bankers themselves.

The annexation of territory through the use of systems also occurs. In food retailing, electronic ordering and delivery monitoring systems (of which perhaps the best example is the ANA Tradanet in the

Figure 2.1 Competitive forces



UK operated by ICL) permit the retailer to go direct to the food-processing supplier and thus cut out the territory of the wholesale distributor. Big retailers, of course, have been doing this for years, but Tradanet allows the not-so-big, with far less purchasing muscle, into the game too.

Substitution of one service for another can also have dramatic effects. Ten years ago access to theatres, opera, ballet, music and sports was largely controlled by ticket booking agencies, that had booths installed in hotels, in busy streets, at airports etc. Nowadays a computer system and some telephone lines replace these physical facilities. The hotel porter or the customer himself acts as the booking agent. The theatre or concert hall is glad to be rid of the business of telephone bookings. In the United States, firms like Ticketron, Ticket Master and Ticket World are competing for a multi-million dollar market. The same development is at an earlier stage here in Europe.

RESPONDING TO COMPETITIVE FORCES

How can an organisation use information technology to respond to the competitive forces we have discussed, and even take advantage of them?

We illustrate different ways in Figure 2.2, and discuss these ways in this section. We have analysed over 100 case histories of organisations using information technology to achieve a competitive advantage, and we present a summary of these in the appendix, which describes their use of IT in terms of the classification we use in this section. We have selected aspects of individual case histories to illustrate the points made in our discussion.

USING INFORMATION TECHNOLOGY TO IMPROVE THE PRODUCT OR SERVICE

One way of using information technology to respond to the competitive forces acting on the organisation is to improve the products or services that the organisation provides. There are essentially three ways in which this may be done:

- By differentiating the product from others.
- By finding or creating a niche and exploiting it.
- By reducing costs without (necessarily) affecting quality.

We illustrate these ways in Figure 2.3 on page 14, which shows how when a product is differentiated or its cost is reduced, the market perception of competing products may be changed, and how a niche product or service may target a selective subset of

Figure 2.2 Competitive responses using information technology

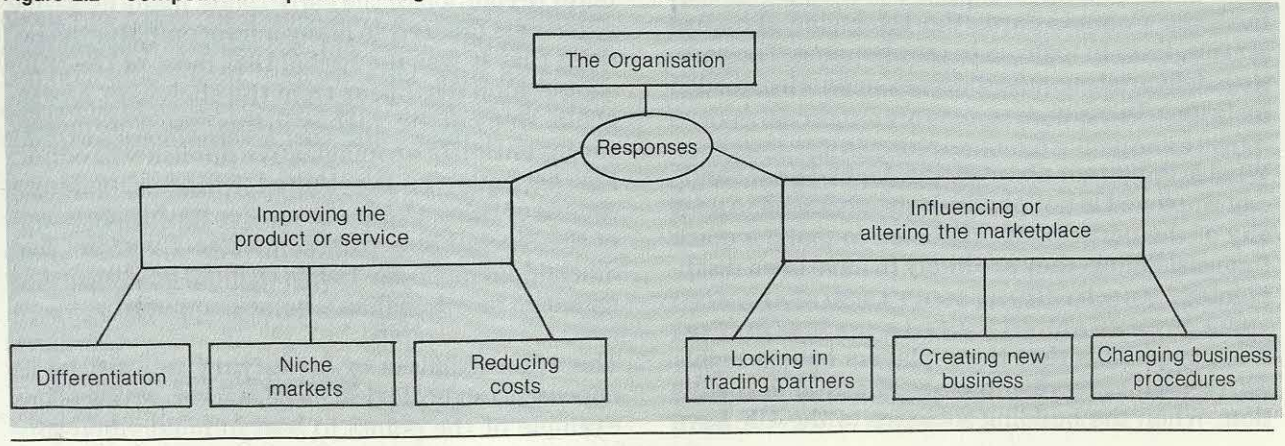
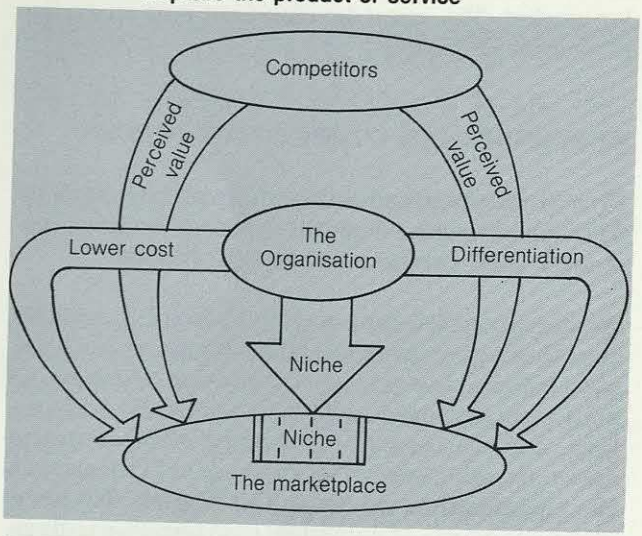


Figure 2.3 Ways of using information technology to improve the product or service



the market. We now turn to how information technology may be used to achieve this.

DIFFERENTIATING THE PRODUCT OR SERVICE

The key to obtaining a competitive advantage by differentiating products or services is to recognise changes in the marketplace that make it responsive to 'new' packaging. While this may seem like merely stating the obvious, the advantages and potential pitfalls to bear in mind are best illustrated by an example.

One of the most notable examples of such an attempt at differentiation is Home-Link, a remote banking service launched four years ago by the Nottingham Building Society in the UK. Before then the society was rather small, operating in a restricted geographic market. It decided that its growth would come not from the traditional route for banks and building societies of establishing branch offices all over the country or merging with another and possibly larger society, but by setting up Home-Link. The Bank of Scotland participates by providing general banking services. Visa provides credit card facilities. Comp-U-Card, the telephone shopping service, links in to provide teleshopping. The service is delivered over the videotex network provided by British Telecom.

What is important about Home-Link? The technology employed is not particularly advanced. And if any of the participants expected to make a quick financial killing, they are likely to have been disappointed.

The key point is that these players have a highly differentiated service in place ahead of deregulation. When the building societies in the UK have most of the statutory limits on their activities removed by 1987 — and they will be allowed to release in nonmortgage credit five per cent of their funds, a colossal amount of money — then the Nottingham Building Society will already have four years experience as a financial services network operator. Some of the other building societies may decide that it is safer to join Home-Link than to set up their own system, struggle up the learning curve, and risk being left behind. That is one possible scenario, favourable to the players in Home-Link. But equally, Home-Link cannot be certain that another and probably larger player will not step in, learn from their experience, and capture the market. Being first is not always best.

One other generic point which emerges from the Home-Link case and others, is that those seeking applications leading to a competitive edge should monitor changing regulations very carefully. Deregulation in any industry — airlines, telecommunications, financial services — nearly always seems to throw up major opportunities. Just as some medical insurance salesmen in the USA follow ambulances to sell medical malpractice policies to people facing surgery, so information system directors should follow deregulators.

IDENTIFYING AND EXPLOITING A NICHE

A market niche is a relatively small market segment with special needs or wants. It must be a genuine niche market, what Peter Drucker calls an 'ecological' niche (a niche that is a natural part of the marketplace with intrinsic characteristics that differentiate it from others) rather than an artificial niche. Sometimes what looks like a niche market may be just the customer base for a specific product. Management must ask itself not just, 'Is there a niche in the market?' but also, 'Is there a market in the niche?'

To illustrate the difference between artificial and ecological niches, we take a light-hearted case from the IT industry itself: At the height of the microcomputer revolution of the early 1980s, many magazine publishers created so many microcomputer 'niche' titles that it was inevitable that most of the titles should soon disappear from the shelves of newsagents. Many of the 'niches' in this case were merely the invention of an imaginative publisher or editor. For example, in the United Kingdom, amongst dozens of titles, there was one for the business user of the Sinclair Spectrum computer. Even Sir Clive Sinclair did not make claims that the Spectrum was meant to be other than a home computer!

This is an example of identifying an artificial as opposed to an ecological niche market. An excellent example of the points to bear in mind when con-

sidering the use of IT to exploit such a niche is presented by the case of Red Lion Inns.

Red Lions Inns is an American chain of 52 hotels. It is linked to the American Airlines Sabre reservations system. Red Lion uses Sabre data to identify frequent travellers on particular routes. Most of them are, of course, business travellers. Red Lion offers them guaranteed bookings at prices that are not discounted, but which are guaranteed not to rise without six months' notice. To travellers with a limited travel budget, predictability of costs may be the most important thing. Thus Red Lion Inns focuses on attracting and keeping the 20 per cent of travellers who provide the 80 per cent of revenues. Indeed, Red Lion has a room occupancy rate three or four percentage points above the norm. Such a modest increment in overall performance may not seem worth the time and trouble. But it needs to be borne in mind that since most of a hotel's costs are fixed, most of the extra revenue drops to the bottom line.

REDUCING COSTS WITHOUT COMPROMISING STANDARDS

Perhaps surprisingly, cost reduction is again becoming an interesting area for information technology applications. In our survey of senior managers, 18 per cent of those interviewed felt that as far as their organisations were concerned, the opportunities to use IT to reduce costs had been milked dry. So they have, within the limits of their existing structure. But information systems can now change the structure of cost, which is a different game altogether.

Many newspapers, for example, are today written and composed in one country or city and transmitted for printing to remote centres. The *International Herald Tribune*, the *Financial Times* and *USA Today* are all printed this way. Readers in the remote regions get their paper just as early as those near the centre, and the cost of hauling tons of paper is eliminated. The European Space Agency (ESA) has been studying the economics of news delivery via satellite, a kind of Reuters or Telerate service for families not businesses. They believe that with a 50:50 split between advertising and subscription revenue at about US$ 75 per subscriber, such services should be economically viable for between 100,000 and 200,000 subscribers. Experiments with domestic electronic news services are also underway in other countries, including Canada and Japan.

In some businesses, opportunities to apply information systems and change structural costs may not exist. But there are three distinct areas in which information technology may be used to maximise an organisation's potential to exploit its pricing structure:

— Selecting a pricing strategy.

— Determining the price.

— Administering the price.

In most businesses, opportunities exist to apply information systems to pricing strategies.

To take an example, since the air transport industry was deregulated in the United States, most airlines set their tariffs relative to the market leader on contested routes but on a 'what the trade will bear' basis where a particular airline dominates a route. This is perhaps what anyone would expect. But to apply that strategy in detail is a hard task. This is what Delta Airlines does. It monitors 5,000 price movements a day in the air traffic market. It analyses these changes by computer and can respond to a major competitive threat within two hours.

After selecting and actually implementing the right price strategy, the next key issue is setting the base price. Some industries are more or less entirely price-competitive. In the construction industry in the United States, all other things being equal, the lowest bidder gets the job. The Red River Construction Company in Texas uses microcomputers to develop its bids. It can reflect and react to price changes more accurately than its competitors, and has a longer period available for negotiation with suppliers.

American Hospital Suppliers (AHS) is an often-quoted case history, in particular the way AHS provided terminals free of charge to hospitals to lock the hospital administrator into their products. But their Bidmodel system is less widely known. AHS salesmen use portable terminals when they visit a prospect to access product descriptions and pricing information. Orders are built up on a spreadsheet, showing alternative packages and discounts. Thus the salesman for AHS is able to select a particularly favourable deal for the customer. The system can also be used to show how exaggerated or even iniquitous are the price and discount structures of AHS's competitors.

Information systems can also be used to administer pricing policy. For example, ARCO, a US oil company, uses data networks to communicate price changes to its distributors. The information is received in minutes rather than hours or days, which enables distributors to change their prices earlier. On price rises, the distributors avoid selling on an inadequate margin. On price dips, they make their local competitors look overpriced.

USING INFORMATION TECHNOLOGY TO INFLUENCE OR ALTER THE MARKETPLACE

How can information technology be used to influence or even change the market?

Every trading company lives in a world where it has to deal with suppliers, customers and competitors. To create a competitive-edge application in the marketplace means changing relationships with suppliers, customers, or both. Such applications usually demand looking beyond the boundaries of the organisation itself to try to influence or change the way other firms work. The organisation is trying, in a way, to infringe on the corporate sovereignty of others to partly run part of their business for them. To induce them to allow this act of partial 'usurpation', the organisation normally has to share some of the benefit of the applications with them.

We have identified three distinct ways in which this may be done:

— Locking in trading partners and locking others out.

— Creating new business.

— Changing business processes or the power structure of an industry.

LOCKING IN TRADING PARTNERS AND LOCKING OTHERS OUT

The first and perhaps most widely debated way of changing the marketplace using information technology is by locking in a trading partner and locking others out. Inter-organisational business information systems (often called IOS for short,) are increasingly used to lock in trading partners. Users of these network-based systems are therefore different companies, rather than different employees of the same company. Figure 2.4 lists different ways in which such systems may be used for competitive advantage.

One of the earliest examples of such a system was CARDIS, a network run by Tymshare for seven exporters, three ocean carriers and two freight forwarding agencies. The system distributes export-import documents for shipments to and from three continents. It has been used for nearly ten years. It creates a kind of electronic cartel, to the disadvantage of all those outside it. The AHS ordering system (discussed above) is another classic case. If an organisation is looking for lock-in opportunities for its business, it needs to think very carefully about the structure of the markets in which it operates. The structure of the market will determine what kind of lock-in is likely to be feasible or advantageous.

A lock-in may be vertical or horizontal. A vertical lock-in operates along the chain of added value from raw material to customer sale. A horizontal lock-in operates across some or all of the players at a given stage in the value chain. Horizontal lock-ins tend to be more defensive. Vertical lock-ins tend to be more aggressive.

Figure 2.4 Using IOS to achieve competitive advantage

Competitive force	*Implications*	*Uses of an IOS*
New entrants	New capacity Need for substantial resources Reduced prices or inflated incumbents' costs	To provide: Entry barriers, greater economies of scale, switching costs, product differentiation, limited access to distribution channels To control market access
Buyers	Lower prices Higher quality More services More competition	To influence buyers: Differentiation, switching costs
Suppliers	Higher prices Reduced quality and services	To reduce switching costs To encourage competition To threaten backward integration
Substitute products	Limited potential return A ceiling on prices	To improve price and performance To redefine products and services
Traditional rivals	Competition on price, product, distribution, and service	To improve cost effectiveness To control market access To differentiate product and company

(Source: Cash J. I. and Konsynski)

One example of a horizontal lock-in is the use of a common system among the major US oil companies for compiling data on oil extraction, production, imports and exports, which is available over a network service. The commonality of this data means that it confers no competitive advantage on individual firms, except insofar as one may be more adept at interpreting and acting upon the knowledge so acquired. It is the group that achieves competitive advantage .

Aerospace companies use vertical lock-ins with their suppliers. Because there is one customer and many suppliers, this is called a 'one-to-many' system. When McDonnell Douglas in the US developed the F-18 Hornet (which first flew in 1978), their O&M team calculated that for an aircraft which fully fuelled and armed would weigh 13 tons, the paperwork per aircraft weighed 22 tons. McDonnell Douglas now uses a network system, which not only

reduces the mountain of paper but also (and more importantly) makes the suppliers a part of the design and production process and thus locks them in. Other examples of one-to-many lock-in systems which are often cited are AHS and McKesson. AHS aimed to lock in hospital administrators, and McKesson pharmacists. The McKesson system is proven to have worked: Johnson & Johnson (a major competitor) sued for unfair competition! — but Johnson & Johnson did not win the case.

Another, frequently quoted example of a lock-in system is American Airlines' Sabre system. In the 1960s, it was just a simple, single airline reservation system — albeit a very advanced one for its time. Nowadays many other airlines also use Sabre. The more that use it, the more attractive it becomes because it offers so many opportunities for making interline bookings, satisfying travellers and earning interline commission. In fact, since deregulation in the United States it is debatable whether an airline actually wants to carry any passengers itself: it can probably make more money on commissions from other carriers, and leave them the cost of flying the aeroplane. But hotels (as we have already seen in the case of Red Lion on page 15), car hire companies, tour operators and a host of other travel firms, now make their services available through Sabre. A perfect example of a competitive-edge application with high benefits for participants has been achieved.

A vertical lock-in may be 'one-to-many' or 'many-to-many'. Sabre is a one-to-many system in the sense that American Airlines is the hub and operator of the whole network.

A many-to-many system is in the making in Europe, however, under the code name of ODETTE (Organisation for Data Exchange by Tele-Transmission in Europe). Just as the making of fighter aircraft generates more paper than plane, so the making, selling, distribution and registration of motor cars is administrative-intensive. ODETTE is a network that plans to link motor manufacturers, component suppliers, motor car trade associations and registration authorities. The first implementation of ODETTE will be in the UK, under the name Motornet. The network will handle inquiries, quotations, purchase orders, contracts, delivery instructions and advice, invoices and remittances. The sponsors of the scheme hope that eventually the cost saving per vehicle will be around $800. Quite apart from any other benefit to its participants, a fully fledged ODETTE system in Europe might serve as a very effective non-tariff trade barrier to suppliers who import but do not manufacture. The convenience and lower cost of the network would be real incentives for the dealers to handle European-built cars. However problems among the suppliers, including the decisions by Ford to go it alone and by Rover to use its own service (Edict from Istel), mean that the scheme will not now go ahead as planned, but that it is likely to co-exist with individual schemes run by some suppliers.

CREATING NEW BUSINESS

There are innumerable ways in which an organisation can create new business or enter a new business area using information technology. But, as innumerable as are the possibilities, as high are the uncertainties. This is the riskiest way in which an organisation can exploit information technology to increase its share of the business. But it is also the one with the highest potential payoff. New business may be created by using information technology as new products or services become feasible (services like IOS mentioned in the preceding section), by identifying new needs or by finding new ways to exploit existing skills and resources.

A classic, and highly successful example of a company using information technology to move into a new business arena, is Reuters. For over a century it was just another news agency. Today it makes more profit from its network services than from its news agency business. It operates four separate networks, of which one is for its own internal business. Of the three external services one is the editorial network that supports the news agency, one runs Monitor, the financial information service, and the third is an online dealing service used for real-time financial transactions. It is all too easy to say with hindsight that given Reuters' position in the market, its mix of skills and resources, and the pace of fast change in the financial market over the past decade or so, its success in creating a new business with IT was inevitable. But more than the right circumstances, the right infrastructure and careful planning are needed for success — also necessary are management vision, a strong nerve and the will to succeed.

Another, less publicised example of an organisation creating a new business is provided by Shelternet, launched in1983 by First Boston Bank, who invested around $10 million in setting it up. Shelternet is the United States' first nationwide electronic mortgage network. It acts as a broking service where clients remain anonymous. Lenders, including large banks and savings and loans institutions, input terms that they are willing to accept. Estate agents and other agencies, for instance the home buying and selling services that some major retailers have set up in their stores, enter requests for mortgages on behalf of their clients. Shelternet then performs a matching process and matches bids and offers. A great deal of paperwork is automated. For example, requests for credit checks are issued automatically when a match is made. Shelternet has gained a foothold in the vast US residential property market. Four

national realty chains including one owned by Sears Roebuck, the largest department store chain in the world, offer the service under their own label. Local estate agents in 42 states have also signed up. However, as so often happens, the success of Shelternet has encouraged others to set up similar networks, including one by the giant Federal National Mortgage Association.

Usually a less risky way of creating a new business is to exploit existing skills and resources available within the organisation and this is quite common. For instance, organisations that have developed specialised software for their particular line of business can market the software to other organisations. Many commercial packages available through software houses started as bespoke solutions for a particular customer. Increasingly, the original customer ensures that the contract is written to provide him with a royalty or licence fee for direct descendants of the system he paid for.

In some situations, where the software solution has been developed inhouse, the originator decides to put it out to the market, either directly or through a software house as the agent. For example, in the UK, ICI — the chemical giant — developed a software and hardware envelope, called ICI Conductor, around the IBM PC that allowed the PC to be used as a multifunction workstation. ICI Conductor, when used with the PC, enables a user to access an IBM mainframe, a Digital Equipment VAX computer, public and inhouse private videotex services and the telex network and, of course, to continue functioning as an ordinary PC. The software also makes the transfer of data from one application to another almost transparent. For instance, data extracted from the mainframe or mini can be passed to Lotus 1-2-3 (the spreadsheet package). The results can then be passed to a business graphics package and the output incorporated into a document produced through Wordstar (the word processing package). ICI Conductor was so well regarded by its internal users that ICI decided to make it available to the wider market through an arrangement with a software house.

In the UK, partly because of deregulation of the telecommunications business, many organisations are offering their inhouse telecommunications expertise and their private networks as a value added network service (VANS). A good example is CCN, a national online personal credit-checking service in the UK, which is used by practically all major firms involved with the personal credit business, including banks, credit card operators, building societies, and mail order firms. Yet it started many years ago as an internal credit-checking service of one of the major mail order firms — GUS (Great Universal Stores).

ALTERING BUSINESS PROCESSES OR THE STRUCTURE OF THE INDUSTRY

Information technology can fundamentally — and very rapidly — change the way business is transacted and the way a particular industry is structured.

Two examples illustrate how business processes can be radically altered:

USA Today claims to be the first truly national newspaper in the United States. It transmits to, and prints at, 17 geographically dispersed printing plants. Even though it began publication only in September 1982, it had reached a circulation of 1.1 million copies in 19 metropolitan areas by October 1983. Satellite and other telecommunications services allow a 36-page edition to be created, transmitted, and printed in eight hours, including full-colour pictures.

In another US example, Federal Express several years ago saw an opportunity to set up a parcel and courier service using information technology in both administrative support and operational activities (such as using automated sorting with the aid of barcodes) — in other words, throughout the value chain. This opportunity arose through deregulation, which allowed competition with the US Postal Services. However, Federal Express went one step further, and introduced a telecourier service — Zapmail — using satellite links. (With a courier both the original source and the delivered material are hardcopy document — but Zapmail, instead of transporting the physical document across the country, is sent by facsimile). The combination of parcel and telecourier service has enabled them to become one of the largest document and small-item carriers in the world outside of the postal services. In Europe, DHL, a major courier company has set up a service called Lasernet using terrestrial links to provide a similar service. Unfortunately, Zapmail was so expensive to set up and run that Federal Express recently decided to abandon the service.

Information technology can also alter the structure of an industry sector. Such a change usually occurs when a service is introduced that links two or more sectors together. For example, Travicom, a service for travel agents in the UK, which originally provided a common interface to different airline reservation systems, is being extended to include links to hotel and car hire reservation systems. Thus, an airline service is evolving and expanding into a travel service. Established providers of such services must either fit in with the changes or act to initiate still more change to remain competitive.

ASSESSING THE RISKS OF USING INFORMATION TECHNOLOGY AS A COMPETITIVE TOOL

In the previous section we have looked at the ways in which competitive-advantage applications may change the products and services that an organisation can offer and how information systems can be used to modify markets. But no organisation looks for these opportunities in isolation from its trading environment. Customers and suppliers are after those organisations' share of the added value, just as it is after theirs. Competitors are naturally after everything. So far in this chapter we have concentrated mostly on the success stories. But what are the pitfalls and dangers of using information systems as a competitive tool?

We have analysed over a hundred cases of organisations using high-payoff or potentially high-payoff applications, and we have identified the attendant risks. The most common problems and risks we have identified are summarised in Figure 2.5 and are the costs of the investment, the length of time for which any advantage may be maintained, second-order effects, correct timing, and matching of the technology opportunities to the organisation.

Figure 2.5 Risks associated with using IT for competitive advantage

Issue	*Risk factors to be considered*
Investment	High degree of speculation often involved. New technical skills needed. New marketing skills needed. Management time needed. Highly-visible results a possible embarrassment.
Temporary advantage	Competitors respond with better product. Competitors 'poach' the organisation's skilled people. Excessive competition squeezes profits out of market.
Second order effects	Unintended effects often hard to predict and control. Excessive power given to trading partners. Business processes changed in unintended ways.
Timing	Unrealistic enthusiasm for the technology. Decision required in climate of pessimism. Technology not ready, too costly or unreliable. Introduction of new regulation. Changing social and business values.
Match to the organisation	Market drivers risk more but can gain more. Market followers need to respond with more creative systems.

INVESTMENT

The first problem is investment. Competitive-advantage applications are usually, by their very nature, more speculative than mainstream data processing. But there is more to the investment than the cost of the new technologies. New skills often have to be acquired. Management time and attention at a senior level are often the prerequisite of success. Many of the examples we have quoted depend on new technology, including the use of communication facilities, and sometimes on high-grade expensive private networks. Such applications need to be carefully evaluated and sold at board level. If they are unsuccessful, failure is embarrassingly visible.

Where organisations can use their existing information technology resources at marginal cost, the risk will obviously be lower (for example, where spare capacity on a mainframe or network is already available). But frequently the highest costs are not related to the technology itself but to such items as manpower, application development and marketing and support.

TEMPORARY ADVANTAGE

The second pitfall is that the competitive advantage created by a high pay-off application is frequently temporary. Every action creates an equal and opposite reaction. The system that our competitors introduce a year or two after ours will incorporate all the benefits that ours offered, plus whatever enhancements they can add. Competitors will be talking and listening most carefully to our customers and suppliers, finding out what they like and dislike about our offering, and how it can be improved. In some businesses, and today particularly in the financial services market, the competition will offer 'golden hellos' and sky-high salaries to the same people who built our system, to build a better Mark II version for them.

What follows from this is that *maintaining* a competitive advantage is often much more difficult than *creating* it. Hence it is not enough to pioneer only once; an ongoing and long-term commitment to being first is needed in order to maintain leadership.

In certain circumstances, the question of whether the unguaranteed promise of a fleeting advantage is worth the risk, the time, the effort and the investment really has to be asked. Sometimes it is not stupid or unambitious to conclude that it is better to refrain from seeking a competitive advantage. Sometimes detailed and level-headed analysis of the prospects will teach us that a grave danger exists in seizing such a temporary edge. It may well be the case that our action, the response of the competition, our response to their response, and so on ad infinitum..., that all of this will inevitably lead to the market becoming overheated and customer expectation constantly overexcited, so that the value added in the whole market becomes inadequate to sustain a constantly rising investment profile. Policies to get the better of the competition at any price, if pursued successfully by all the main players in a

market, simply lead to mutually assured destruction. This has already happened to some extent in the airline industry and the motor industry in many countries, and in our view is beginning to threaten the travel business and the financial services industry. We hope our readers will not interpret this as Butler Cox giving tacit approval to cosy cartels. But there is such a thing as excessive competition, to the detriment of an industry as a whole and ultimately to the disadvantage of its customers.

There is an interesting and rather surprising outcome of this argument. When searching for a competitive advantage application, what is the worst fate that can await an organisation? Not to find one, is the obvious answer. Not true. The worst fate is to find one that produces a temporary and marginal advantage — and then backfires, leaving the last state worse than the first. The crucial thing is to reflect upon the medium-term impact of the proposed change on the structure and health of the market, something the systems function obviously cannot do without the help of senior managers who are in direct contact with the market, and with the organisation's customers.

SECOND ORDER EFFECTS

All technical innovations have second order or nth-order effects that are very hard to predict, let alone control. Systems designed to secure competitive advantage are no exception.

Firstly, the more long lived such a system is, the greater the advantage to all its users. After a while, however, the users of the system develop proprietorial feelings about it. It becomes institutionalised. The kind of user power that hardware and software suppliers meet through user groups also comes into play. Even though the original provider and operator of the system would like to think that he has ultimate control over how the system should be developed, expanded, or refined, he will find that he has acquired obligations to his partners in the venture (the users), and indeed that he is vulnerable to their collective power.

In the worst case, the other partners may realise that the organisation has succeeded in its objective of taking the competition out of the game, which soon becomes clearly disadvantageous to them. The competition may be churlish enough to point this out, either to the partners we have locked in or to a judge.

When users revolt, the handiest weapon they have is standardisation. Take for instance the case of an insurance underwriter providing information and quotations to agents and brokers. As long as there is only one such service, its users will be reasonably content. But when the equal and opposite force causes a second, then a third, then a fourth underwriter to offer a service, then the users revolt. They cannot see why their office should support four kinds of dedicated terminal with four kinds of user interface to learn. In due course all the underwriters are obliged to harmonise their services, and their competitive advantage is reduced or eliminated. The worst loser is probably the original innovator, because he bore a heavier share of the upfront investment and the infrastructure cost. Unless he got sufficient benefit during his period of unchallenged advantage, for him the whole venture could well prove to be a financial disaster.

Secondly, there are second-order effects that may lead to unintended and undesirable outcomes. For example, UK car manufacturers introduced applications (usually based on videotex) allowing car dealers to trace requested but locally unavailable vehicles at other dealers' locations. The effect, both intended and achieved, was to provide the car manufacturer and the dealer with a competitive advantage by being able to provide the customer with exactly the car he wants at very short notice. But the second-order effect that the car manufacturers had not allowed for was that the ability to get cars at short notice led dealers to reduce the levels of their stock — which is of course against the interests of the car manufacturers!

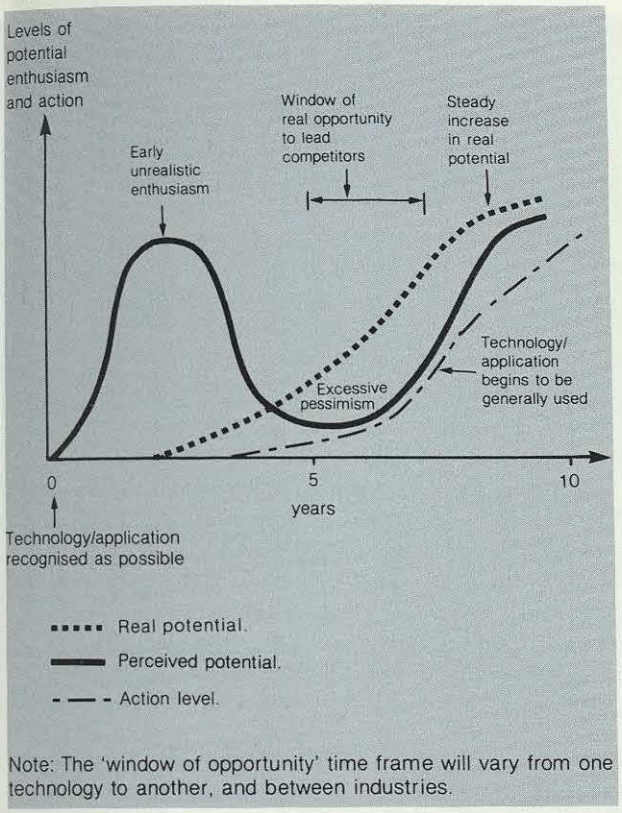
TIMING

The importance of correct timing is paramount. A simple, not-quite-right application launched at the right time is far more likely to be successful than the best-designed, most sophisticated application marketed at the wrong time.

Examples in the IT industry abound: facsimile, fixed discs, text processing and videotex are technologies that have existed for a very long time, but only the last half decade or so has seen such technologies really make an impact on the market.

Typically, as a new technological development becomes widely talked about in the computer community and at technical conferences, there is an early, and usually unrealistic enthusiasm for the latest breakthrough in technology. Over the next few years, when very few products are being purchased, and as the products that are used are found not to live up to expectations, or are used in limited pilot projects, a mood of pessimism sets in. Usually, about four or five years after the initial breakthrough, organisations begin to learn how to use the new technology, and the level of enthusiasm rises again, but this time at a more realistic rate. However, the real potential for using the technology begins at some point in time after the initial period of unrealistic enthusiasm, but before there is widespread

Figure 2.6 The 'window of opportunity' concept



Note: The 'window of opportunity' time frame will vary from one technology to another, and between industries.

acceptance of the technology and its products. This means that the successful technology leaders are likely to have to make decisions about exploiting a technology during the very period when there is most doubt and pessimism about the technology's prospects.

This pattern of events usually means that there is a 'window of opportunity' when would-be technology leaders can act aggressively to take a lead over their competitors. It is a time when suppliers are often willing to carry out product modifications to meet their customers' needs. It is also a time during which market trials can take place and experience with the new technology can be gained. The 'window of opportunity' concept is illustrated in Figure 2.6. This figure also shows that the 'window' can often be as long as two or three years, although this will vary considerably, depending on the technology. The real period of opportunity can even coincide with the period of maximum pessimism about the technology.

However, judging the correct timing for a new product is not an easy task. There are factors that are related to the technology: cost, size, standards. There are factors related to the political and economic environment: deregulation, wealth of target markets, extent of competition. But there are other factors that are less predictable and measurable, and these relate to changing social and business values. Because of their uncertainty no computer application, however well designed and marketed, can be sure of success.

MATCHING THE TECHNOLOGY TO THE ORGANISATION

Competitive-advantage applications may be based on technology that is relatively simple, such as videotex, or very complex such as artificial intelligence. It is important to recognise that some companies are more comfortable with very far-out technology than others. Some firms are natural leaders, others natural followers. It is important to undertake tasks for which the organisation is well-fitted.

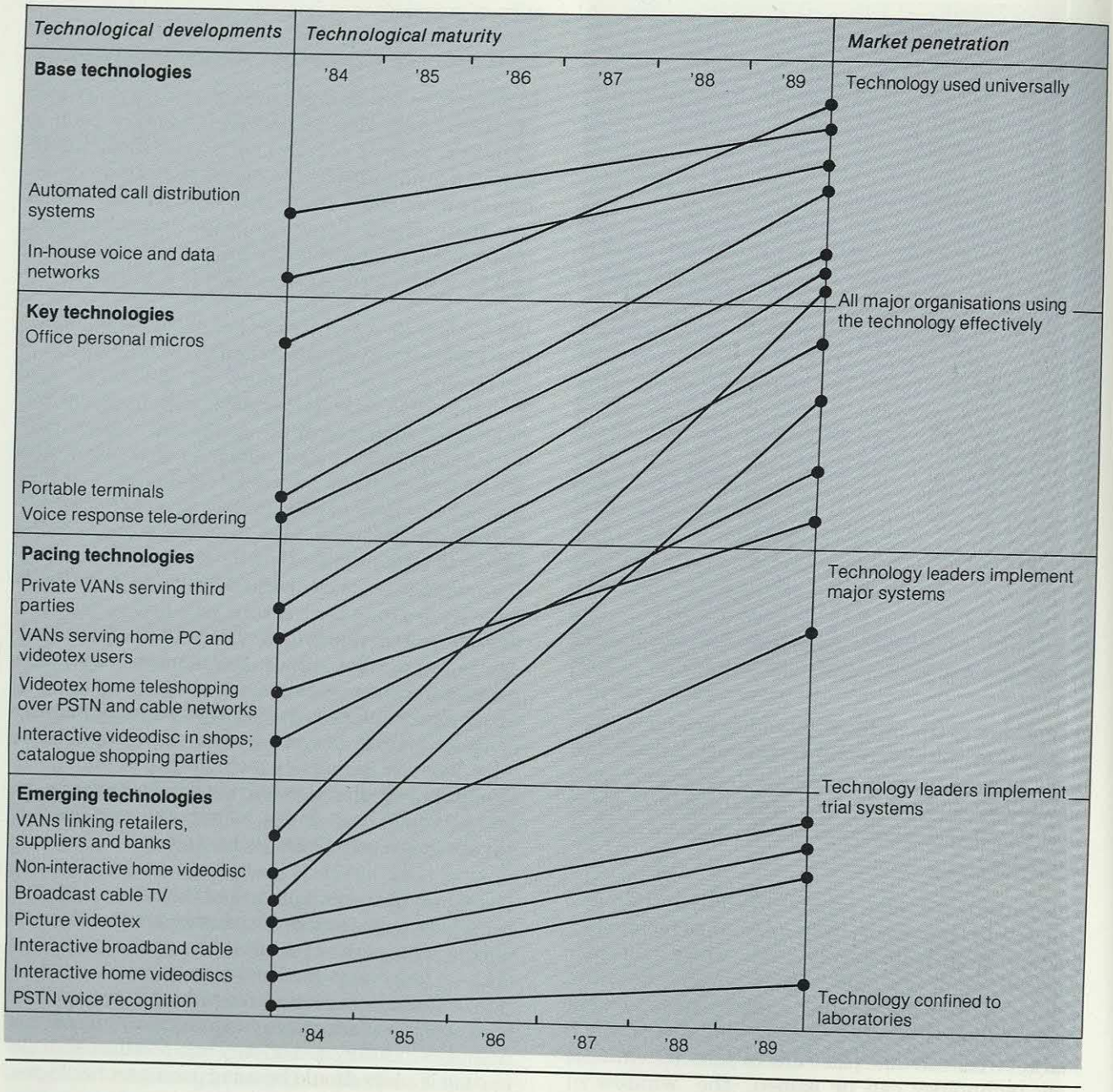
We use a four-way categorisation for technologies (see Figure 2.7 overleaf). When these four classes of technology are embodied in products and introduced into the marketplace, they have a different kind of impact on different kinds of organisation. Technology is significant only if it can be used. And not all firms can use the same technology. The four interactions between technology and user organisation are the following. Emergent technology is in the hands of a few pioneers, who are carrying out experiments. It is not clear whether emergent technologies have a long-term future, or whether they will ever be used in real-world systems. Pacing technology is the market driver; the market leaders are using it and the rest are watching or trying to catch up. Key technology is used by a substantial minority of those market players with a clear competitive edge. The rest ignore key technologies at their peril. Finally, base technology is in the hands of every market player. There is no longer any competitive advantage in using base technologies.

The figure presents a picture of the take-up of various technologies across all industry sectors. For particular sectors, the technologies or their stage of take-up may vary. Each organisation (or each division or strategic business unit within it), given a little honest self-examination, can judge its own position within its industry sector. Any organisations that are market leaders should be using pacing technologies, as long as they are interested in remaining number-one. Otherwise, it will be better to wait until the technology enters the key stage. Picking up technologies in the base stage is safe and sound, but unlikely to secure any competitive edge in terms of technology alone. It should however be remembered that 'low technology, high-creativity' systems can also give competitive edge. So even if an organisation is not yet a market leader, it can still become one.

THE SIGNIFICANCE OF THE VALUE CHAIN OF AN ORGANISATION

A basic tool for determining the sources of competitive advantage, and one that we return to in our next chapter on developing a strategy, is the value chain.

Figure 2.7 Categorisation of technologies

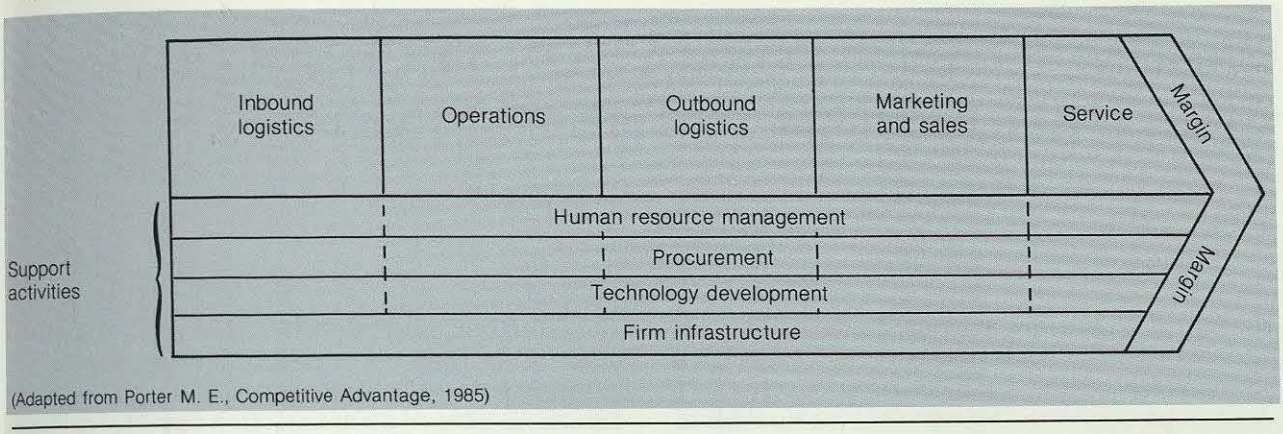


Briefly, a value chain is a representation of the activities that a firm performs to produce, market, deliver and support its products and services. Many factors influence a company's value chain and the way it carries out individual activities, in particular its strategy, its approach to implementing its strategy, and the economics underpinning the activities themselves.

Whilst value chains for companies in the same business sector are broadly similar, there are differences that make the value chain for any particular company unique. These differences are extremely important, and they are a source of an individual organisation's competitive advantage. Therefore, it is important for each organisation to establish its own value chain, rather than attempting to define it from generalised knowledge of other companies operating in the same business sector.

The value chain consists of value activities and margin (see Figure 2.8). Value activities are the building blocks a company uses to create a product valuable to its customers. Margin is the total value minus the total cost of providing a product or service to the company's customers. Value activities divide into two general categories, primary activities and support activities. Primary activities are concerned with obtaining products or components from a supplier, creating a product or service and selling and trans-

Figure 2.8 The value chain of an organisation



(Adapted from Porter M. E., Competitive Advantage, 1985)

ferring it to the customer. At the supplier (inbound logistics) end of the chain, cost is important, but as one moves through the value chain to the customer end (outbound logistics, marketing and sales, and service), value becomes more important. Support activities, as the name implies, support the primary activities by providing manpower resources, technology, and so on.

The characteristics of the value chain of an organisation are key to identifying successful strategies for achieving a competitive advantage. For example, in a service industry such as a retail bank, outbound logistics and marketing and sales are the most vital to competitive advantage. In a manufacturing industry, such as electronics, technology development is vital to competitive advantage. But selecting the appropriate category in each case will need to be a matter of careful judgement, based on experience and background knowledge of the business sector. For example, marketing and sales departments frequently also perform service functions.

To diagnose competitive advantage we also need to understand the organisation's customers' value chains before the competitive opportunities open to the organisation can be established. A company's differentiation is a function of the way its own value chain interacts with its customers' value chain. Differentiation stems from creating value for the customer through the company's impact on the customer's value chain.

Thus, information technology can create competitive advantage through its impact on the company's value chain, for example by lowering costs or enhancing differentiation. However, value activities are interrelated. Applying information technology to one activity can often have consequences right across the organisation's business, and this must be taken into account when planning ahead.

SUMMARY

Information technology has become one of the few convincing weapons organisations have available for gaining a larger share of the added value in the market. The examples we have described illustrate areas in which competitive-edge applications appear most likely to be available. But in some circumstances, an application conceived and designed to yield a competitive advantage might yield more future problems than benefits.

How then does the individual organisation set about the search for applications leading to a potential high payoff? We do not claim that we have a simple recipe for success. But as part of our next chapter on planning an IT strategy, we include some guiding principles and tools that we believe make the search for such applications more purposeful and hence more likely to succeed.

Chapter 3

PLANNING AN INFORMATION TECHNOLOGY STRATEGY LINKED TO THE BUSINESS

We have discussed how information technology can be a vital element contributing to the competitive performance of the business. Clearly, then, IT strategy must serve the objectives of the business in both the long and short term, yet in a surprisingly large number of organisations IT strategy planning is at best only loosely coupled to business strategy planning. In yet others, the need for an IT strategy is questioned altogether. In our survey of senior managers drawn from Europe's top companies, over 60 per cent of organisations with an IT strategy answered 'yes' to the question of whether it is linked to business strategy. Yet on probing, in many instances this link turned out to be little more than line items in the organisation's business strategies, or budgeting items in financial plans.

We first discuss in this chapter what a strategy is — a much debated subject — and why there should be a need for one for information technology. We provide guidelines explaining how an organisation's value chain and its current systems experience influence its strategic options for IT. We then describe activities in the strategic planning process including a selection of tools and techniques that may be applied.

WHAT IS A STRATEGY AND WHY HAVE ONE FOR INFORMATION TECHNOLOGY?

We must first agree on what we mean by strategy. The word 'strategy' encompasses several different, but related, concepts. It originally denoted the art of generalship, but in business, as in war, 'strategy' is often used to describe very high-level, long-term plans that set out to answer questions like "what business should we be in?" Sometimes the word is used to refer to a single, crucial issue — whether it is long term or not. In this report we use the term primarily in the long-term sense.

The issue of when a plan can be called strategic is almost a philosophical one that occupies many pages of learned journals and much discussion among experts and not-so-experts. We believe that an excellent, more practical way of deciding whether a planning exercise is strategic is to look at the potential effectiveness of decisions that result from the plan. This idea of increasing effectiveness is represented in Figure 3.1. Financial planning and forecasting-based planning (often regarded as strategic planning if the budget or forecast covers several years) in fact has very low effectiveness because the future is merely being predicted. Externally oriented planning is a quantum step up the effectiveness metric because it attempts to manage the future, at least as far as the firm is concerned. Finally, strategic management itself — the willingness to make major and fundamental changes in direction — is potentially the most effective (and, of course, the most risky) because it attempts to create the future.

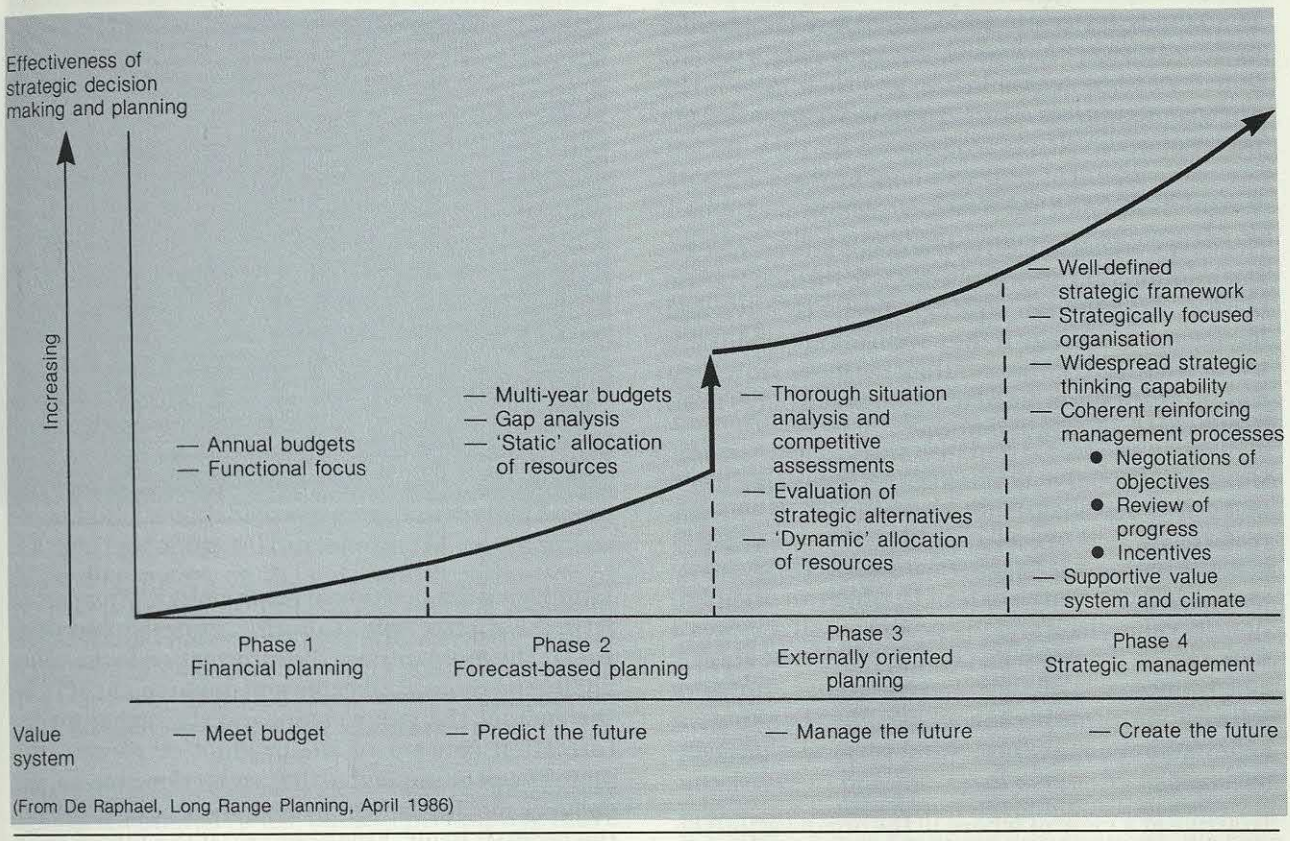
WHAT IS A STRATEGIC IT PLAN?

To be fair, most organisations have a systems plan — of sorts. Often it is a hardware replacement or enhancement plan and not much more. Sometimes it is an incremental budget plan that shows the changes (usually upwards) of the various line items in the annual budget to cater for inflation, expected changes in hardware and software prices and increases in computer workload and equipment. These plans are fine in their way but they are not strategic plans, because they assume that tomorrow will be largely the same as today, and that neither the firm nor its environment will change in any substantial way. What is missing from these plans is any concept of anticipating or managing change, much less of creating the future.

A strategic IT plan is a statement of the direction in which IT should develop, over the medium-to-long term, to achieve agreed business objectives of the organisation, with an indication of the resources required and the priorities for their application. It guides future investments in IT to support, and sometimes determine, corporate strategy and business objectives.

Clearly, unless IT is planned, there is very little chance that by sheer good luck alone IT will match the organisation's needs and help it gain competitive advantage. This is not to say that intuition and quick response are not worthwhile; what is important to note is that unless there is a strategy to begin with,

Figure 3.1 Phases in the evolution of strategic planning



(From De Raphael, Long Range Planning, April 1986)

all short-term plans will be ad hoc, pull in different and perhaps opposite directions, and eventually lead the organisation to nowhere in particular — perhaps at great cost. Worse, lack of direction may allow the organisation's rivals to gain advantages at its expense.

The IT strategy provides a framework within which individual projects and systems can be developed and assessed. It provides a yardstick by which changes and progress can be measured and the impact on business objectives assessed. It allows economies of integration and sharing, and avoids the costs that arise from lack of compatibility and the unnecessary duplication of effort. Once agreed, it also defines policies that avoid the need for senior management to concern itself with many day-to-day problems that invariably arise when individual IT projects are planned in an ad hoc fashion. It enables the organisation to cope with growth and to respond to and manage change.

WHY HAVE AN IT STRATEGY?

Information technology is now so pervasive and has great potential for affecting the business of practically all kinds of organisations. The impact of IT can be felt at three levels (see Figure 3.2): the general business environment level; the level of the organisation's marketplace, involving the activities of its rivals and other market participants; and the organisation's own level, which is in turn affected by the impact IT has at the two external levels. Planning for IT is therefore vital for most organisations.

Information technology is changing so rapidly that it may seem impossible to have an IT strategy. However, as our definition states, a strategic IT plan relates future development of IT to business objec-

Figure 3.2 The three-level impact of IT

Business environment level: IT changes an industry's: Products and services Markets Production economics
Marketplace level: IT affects key competitive forces: Buyers Suppliers Substitution New entrants Rivalry
Organisation level: IT affects a firm's strategy: Low-cost leadership Product differentiation Concentration on market or product niche

(Adapted from G. L. Parsons, Sloan Management Review, Spring 1984)

tives. Furthermore, our experience shows that while it may be difficult to predict changes in specific IT products, it is not too difficult to forecast the life-cycle/maturity of generic technologies and the impact of those technologies, and their take-up by any given industry sector and the organisations in that sector.

WHO NEEDS AN IT STRATEGY?

Not every organisation feels it needs an IT strategy. But by definition all organisations for whom the use of IT is, or could be, strategic needs to have and implement a strategy if they wish to remain in control of what is a core part of their business. How then can an organisation judge whether and where IT can make a strategic contribution?

Often intuition, business sense or the activities of competitors will provide the answer. However, perhaps the best overall indicator of how critical IT is to the business is its information intensity. Information intensity is the extent to which an organisation, its value chain and the products and services it sells, rely on information. Organisations that employ a high proportion of unskilled workers are not very information intensive as a whole. Thus banking is a highly information-intensive industry, whereas mining is not.

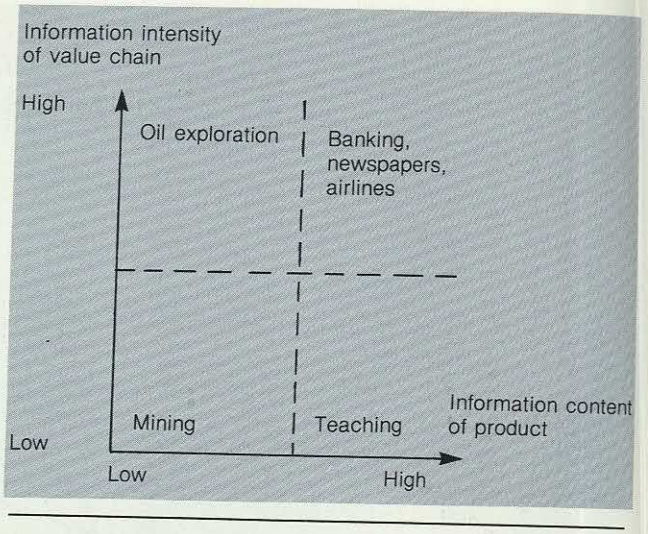
To arrive at a view of where in the organisation the use of IT is strategic, it is necessary to focus on the information intensity of the organisation's value chain and its products or services.

— *Information intensity of the value chain.* We have discussed the concept of the value chain in the preceding chapter. Briefly, the value chain runs from the company's suppliers, through the company itself, then on via the company's distribution channels to the customers. As one moves along the chain from supplier to customer, price becomes more important than cost, and then value becomes more important than price. Each of the activities in the value chain rely to greater or lesser extent on information. Therefore the extent to which IT is strategic will depend on the strategic significance of each activity *and* its information content.

— *Information intensity of the product.* Every product or service has both a physical and an information component — at its most basic the information component may simply be the physical dimensions of the product. Using information technology to enhance the information component can have a much greater impact than using it to reduce the cost of the product.

The relationship between information intensity of the value chain and information intensity of the product is shown in Figure 3.3 together with some examples.

Figure 3.3 Information-intensity matrix



Identifying the position of an organisation (or part of it) in this matrix helps to define strategic objectives for IT: the more intense the information in the value chain, the more applicable will deployment of IT be throughout the value chain; and the higher the information content of the product or service, the more IT can be applied to the production process, the delivery mechanism or, indeed, incorporated within the product itself. Furthermore, if the information content of the product or service is high, then the information itself (as distinct from the product or service) may be a saleable product in its own right. For example, such was the case with a major UK mail order firm — GUS — who identified the information needed for credit checking as a valuable asset; this information is now sold as an online service through a subsidiary — CCN.

HOW DOES AN ORGANISATION'S SYSTEM EXPERIENCE AFFECT IT STRATEGY?

Before an organisation can decide to exploit its information systems for strategic advantage, it must assess how it is positioned in this respect. One way of doing this is to match the potential contribution of IT to the total value added with the organisation's current systems commitment and its experience with IT. We show the relationship in Figure 3.4.

Less experienced organisations

For organisations with low information systems experience (Figure 3.4 left half) one of two positions will apply depending on the potential contribution of IT: one is of safety, if the potential contribution is low (Figure 3.4 bottom quadrant), and the other, is 'beware', if the potential contribution is high (Figure 3.4 top quadrant).

The 'safe' position is perhaps obvious: companies in this position have little to gain from investment in IT.

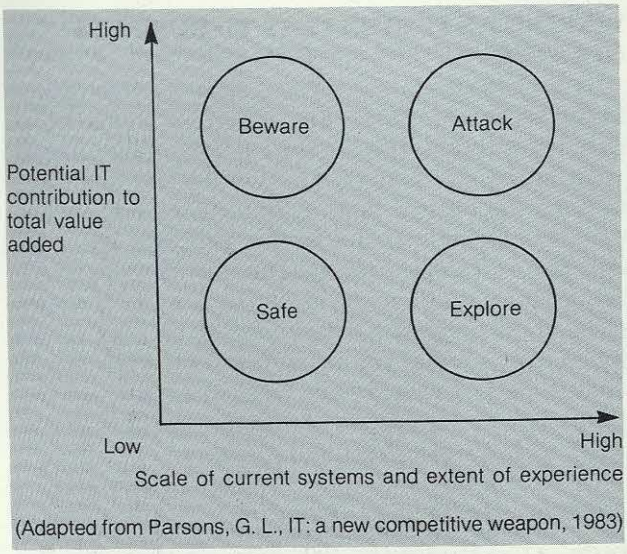
The 'beware' position, however, is one where the organisation is vulnerable to competition. Because the internal scale and experience of information systems is low but the potential contribution of IT is high, the organisation needs to act to resolve this imbalance: the organisation's capabilities may be bolstered or an outsider invited to take over — this could be a systems house or even a facilities management firm. In the case of a merger with a competitor or with a company in a related sector, a systems function in this position would risk being a candidate for takeover by the other company's systems department. In any case, an organisation in this position should beware of attack by competitors, or by new entrants to the sector, and plan its defensive strategy accordingly.

Experienced organisations

Organisations with high systems experience (Figure 3.4 right half of figure) can take one of two positions depending, again, on the potential contribution of IT. One is to explore innovative ways in which to exploit their IT assets and experience, if the potential contribution is low (Figure 3.4 bottom quadrant). The other is to attack, if the potential contribution of IT is high (Figure 3.4 top quadrant).

Often, an attack can be successfully mounted, not against traditional rivals, but as a preemptive move on firms in related sectors, thus enlarging the scope of the business and its base, without drawing the wrath of traditional opponents. The key players in the related sector rarely take the newcomer seriously until it is a little too late. A good example is Marks & Spencer in the UK. Traditionally specialising in clothing and accepting only cash or cheques as payment, it moved into the food retailing business some years ago with own-label goods exclusively. More recently, it has moved into own-label credit card operations. The result is that shoppers are now buying higher-value food items and paying by credit-card — at the expense of both established food retailers and established credit card operators. Moving on with an established credit card operation, Marks & Spencer is now turning to the furniture and home furnishings sector. This move into higher-value retailing would have been impossible in the old 'cash-only' environment. In turn, the credit card operation would not have been possible without IT support.

Figure 3.4 Positioning an organisation with respect to information systems



(Adapted from Parsons, G. L., IT: a new competitive weapon, 1983)

The explorative position would apply where the information systems department is more experienced and has more resources than is perhaps needed for future systems. In that context, it may be sensible to explore, for example, exploiting the strengths of the department externally, perhaps as a profit centre providing services to external as well as internal clients.

WHY IS DEVELOPING AN IT STRATEGY SO DIFFICULT?

If developing an IT strategy is so important, then why do relatively few organisations do it? A third of Europe's largest companies do not have a strategy according to our survey of senior managers. One important reason is that developing such a strategy is a difficult task for many organisations. We have encountered several common objections and problems, among them the following:

- "We've never done it before and don't even know how to start."
- "It's complicated and messy and we don't know what to do."
- "There is no explicit business strategy to base it upon, so where do we begin?"
- "The business strategy does not readily translate into IT terms, so what do we do?"

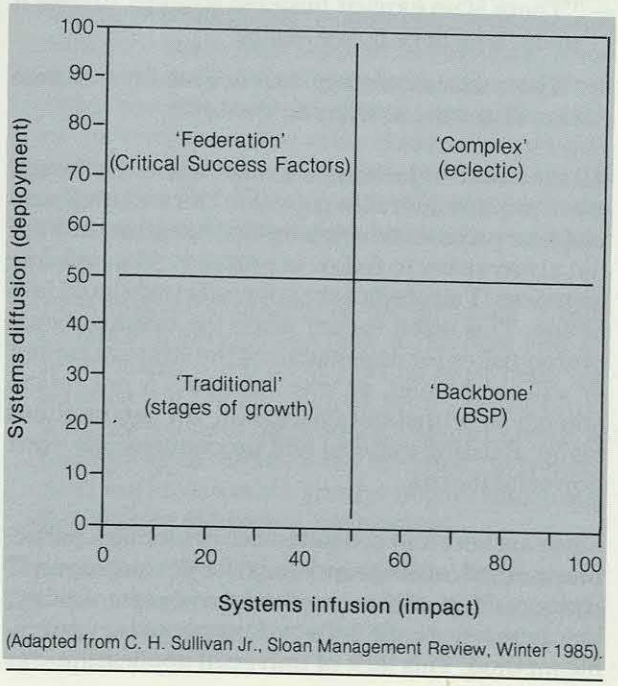
All the above objections are valid, and even though there are innumerable papers in the technical and business press on developing IT strategies, they are not always easy to follow in practice. Also, in some instances IT strategies are not easily translated into action. This often occurs when the organisational prerequisites for implementing the strategy cannot or will not be met, or when the plan is not robust enough to withstand changes in the assumptions made. Existing systems and procedures can exert powerful inertia.

Some authors and consultancies prescribe a particular method, often proprietary, for developing an IT strategy. Most of these methods have some validity, but there is no single universally accepted or applicable method. This lack of universal application was

underlined by C H Sullivan Jr, who assessed three well-known techniques for developing IT strategies to illustrate the point: Nolan & Norton's 'Stages of Growth', IBM's Business Systems Planning (BSP), and John Rockart's Critical Success Factors (CSF). Each of these techniques was developed at a particular stage in the evolution of information technology, and most large organisations have moved beyond those stages. The use of IT in organisations has progressed in two directions: firstly, towards greater 'systems diffusion', or greater deployment of IT throughout the organisation; and secondly towards greater 'systems infusion', or greater impact of IT within the organisation itself and in its business activities. Figure 3.5 shows systems diffusion along the vertical axis and systems infusion along the horizontal axis. The resulting four quadrants reflect different kinds of system environment:

- Traditional: In a 'traditional' IT environment, the degree of both diffusion and infusion is modest. For many large organisations, this stage occured in the early to mid-1970s.
- Backbone: In a 'backbone' IT environment, IT is used strategically in key business functions but its deployment is centralised and not widespread throughout the organisation. For most large organisations, this is also a historical state. However, in some organisations, even though IT is deployed widely, only a few core functions depend on it critically.
- Federation: A federated IT environment, where there is widespread and distributed deployment of IT, but modest impact, is relatively rare. This model would fit the head-office functions of some large and complex organisation, where the operating companies have their own IT services, but where there is some interchange of data between those companies and head office.
- Complex: Complex IT development — with a high degree of deployment and a high degree of impact — is the stage in which many large commercial organisations find themselves today.

Figure 3.5 IT strategic planning environments



(Adapted from C. H. Sullivan Jr., Sloan Management Review, Winter 1985).

Different IT environments require different approaches for planning an IT strategy. Thus Sullivan believes that Nolan's stages of growth is most appropriate for the traditional environment, BSP for the backbone environment, CSF for the federation environment and an 'eclectic' approach — a combination of different methods — for a complex environment.

In our experience, whatever the stage of development or the kind of information systems environment of the organisation, a single systems planning methodology alone is not enough for effective IT strategy planning. Organisations who choose a particular methodology are often disappointed because they expect a single and simple cure-all for all the IT ills that beset the organisation. It is unreasonable to expect this of any methodology. It is also not how organisations plan in other areas of their business. Analytic methods are necessary for most kinds of planning, but at various stages in the process political considerations take over. Only if this is recognised, do tools and methodologies provide a worthwhile focus and perspective to the planning process. In this context, it is particularly important that the strategic planning process involves those in key business functions across the organisation. Otherwise the plan will be regarded merely as a creature of the IS function — even if it is otherwise faultless as a plan.

LINKING AN IT STRATEGY TO BUSINESS STRATEGY

In this section we firstly analyse why it should be so important to link the IT strategic planning process with business strategy, and we discuss organisational and political factors that, as we have seen, play an important role in this process. We then describe a strategic planning framework and a selection of tools that may be used to link an IT strategy to business ojectives. These tools have been developed over several years, having evolved from our consultancy experience and what we believe are the best ideas and methods of various workers in the field, including Rockart and Alloway.

BUSINESS STRATEGY PLANNING

We first highlight the need to link and, if possible, to

integrate the IT planning process with the business planning process. Most large organisations have a formal long-term business planning process that cycles through various levels of the hierachy, with one or more iterations, resulting in an annually revised long-term plan and a one-year operating plan and budget.

Often IT planning is completely isolated from business planning, being done almost as an afterthought or as an adjunct to the main planning. This dissociation implies either that IT is very different from the rest of the business's activities or that it is unimportant and can be treated as peripheral. As we have pointed out throughout this report, both these views are gross misconceptions. IT expenditure, although it may be only a small fraction of a firm's turnover, is a large amount of money, and the way in which this money is spent can have considerable impact across the business. Therefore IT should be considered within the mainstream of business activities just like, say, production or marketing would be.

On the other hand there is a dangerous misconception especially amongst the richer, technology-aware companies, that spending money on IT will automatically help in solving whatever business problem might be current. This is not so. There is a right way and a wrong way to invest in IT (see Figure 3.6). Put simply, if IT investment is increased in the absence of a sound business strategy, then the money will be wasted. If, however, IT expenditure is made as a result of, and as a part of, a business strategy, then it will be worthwhile.

ORGANISATIONAL ISSUES, MECHANISMS AND POLITICS

The person responsible for IT planning must not only understand the business planning process. He must also work closely together with both the business managers responsible for delivering business results and with the corporate officer responsible for consolidating the individual plans and for putting the corporate plan together. Understanding organisational issues and politics is therefore essential.

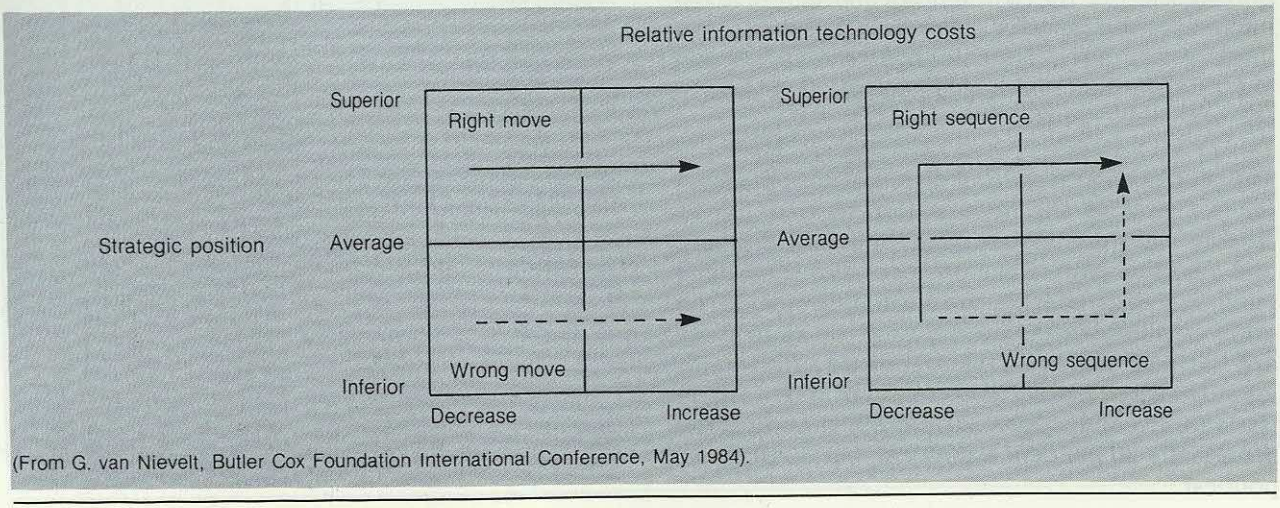
Corporate culture

It is important to respect the corporate culture and working patterns of the organisation. For instance, most firms in the fast-moving consumer goods (fmcg) sectors tend to have very short time horizons. Even senior managers are personally concerned with weekly, and sometimes daily, figures. Next season is important, but next year is far away. For such organisations, IT planning must not appear to be a theoretical exercise about the never-never land of five years in the future. It would be incorrect, however, to assume that fmcg firms do not practice long-term planning. One need only look at the structural changes in retailing in Western Europe over the past decade to see that without long-term planning, the hypermarkets and out-of-town shopping centres and the modern 'galleria' style city-centre shopping malls would not have been possible. Business and IT planners must therefore recognise that although long-term planning is required to ensure the future health and survival of the enterprise, short-term considerations may cloud the longer-term view of many business managers.

Politics and IT planning

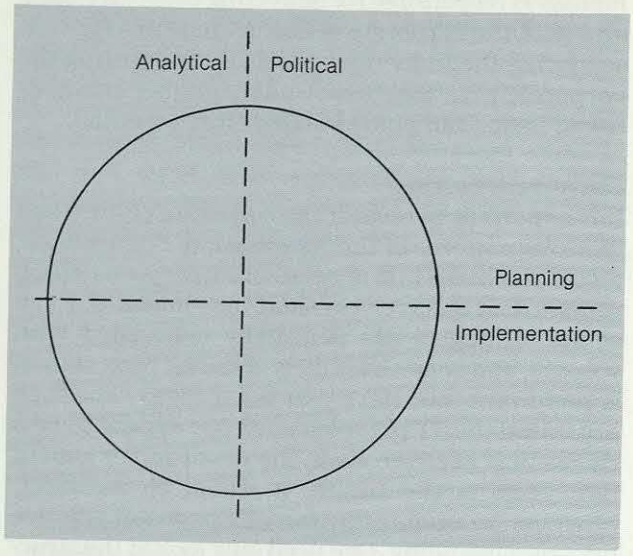
As we have indicated, the political element of planning is often more important than the analytical element. This is particularly difficult for many systems people to come to terms with because of the highly analytical character of their work and their training. We represent the relationship between the political and analytical aspects of strategic IT planning in Figures 3.7 and 3.8 on the next page.

Figure 3.6 Information technology investment strategies



(From G. van Nievelt, Butler Cox Foundation International Conference, May 1984).

Figure 3.7 Aspects of strategic management



The left hemisphere in Figure 3.7 is the analytical one, where most systems people are comfortable. The right is the political, by which we mean 'the art of achieving the possible' rather than any negative or derogatory sense that might attach to the term. The upper hemisphere is that of planning and the lower is that of implementation. All too often, IT strategy planning is heavily biased towards the analytical. This gives technical and logical credibility to the plan. But to achieve organisational credibility, political skills need to be emphasised.

Figure 3.8 is a now classic flow diagram of the planning process, with one major exception. This model, derived from the work of Kolb and Frohman, adds the steps of scouting and entry before the more traditional activities. These two are highly political activities.

In scouting the planner is assessing the best way of broaching the idea of the need for an IT strategy. The purpose is to find the right sponsor and mentor at the highest possible level for the project, to initiate communications and to create the right 'climate'. Scouting is 100 per cent political. If successful, it leads to the next step — entry.

This step is about entering into the main business environment of the organisation so that the IT strategy study is seen to be something quite ordinary and a normal part of the business, not something alien, to be treated with caution and suspicion. The entry step establishes the value of the IT strategy and the feasibility of carrying it out; its purpose is to agree the scope and focus of the study and to obtain the authority and support to proceed. The entry step is normally 20 per cent analytical, but 80 per cent political.

Other steps in the planning process will vary with regard to the balance between the analytical and the political. What the planner needs to recognise is that even the most mechanistic of planning tasks will have some political aspects that need to be taken into account.

PLANNING ACTIVITIES AND TOOLS

In this section we describe the planning activities that follow raising the need for an IT strategy, and acceptance of this need and the feasibility of conducting the planning exercise. These activities comprise firstly an assessment of the relevant business and IT factors. The assessment of business factors reflects the three-level impact of IT we discussed on page 25 and therefore includes three sets of factors:

— Business needs.

— Competitive forces.

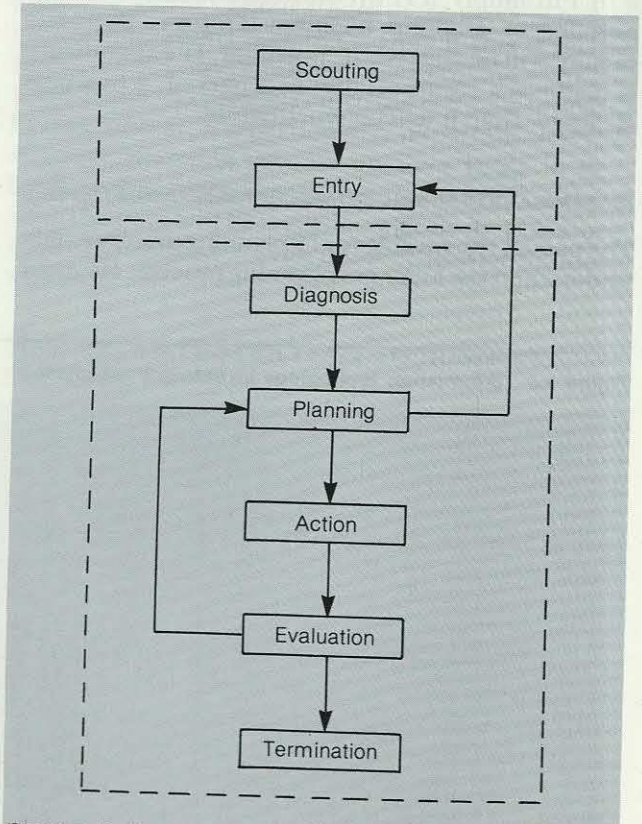
— PEST (political, economic, social, technological) factors.

The assessment of IT factors includes:

— Existing IT facilities.

— New developments and trends.

Figure 3.8 The Kolb/Frohman model



(Based on D. A. Kolb and A. L. Frohman, Sloan Management Review, Fall 1970).

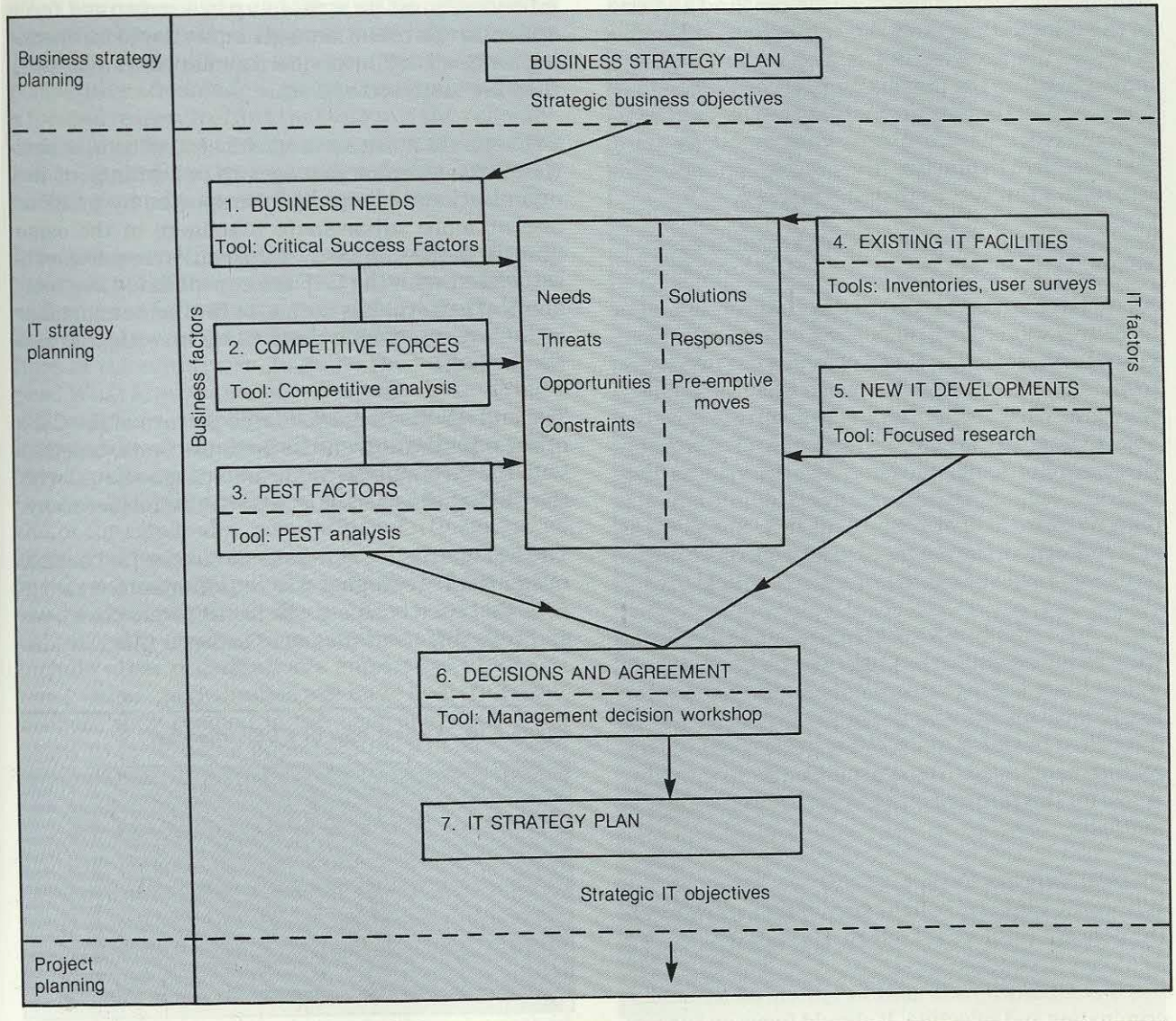
These factors are then matched and agreed, leading to the formulation of the plan. The framework of planning activities and relevant tools is illustrated in Figure 3.9. The tools and techniques that we discuss are of course not the only ones available. We have selected those that make an explicit link between IT and business objectives and that we know from our experience can work well in practice.

The planning activities we discuss are numbered only for the sake of convenience and easy reference. We discuss each activity in the process in turn, together with some relevant tools or techniques. The emphasis placed on each of these will vary in practice from organisation to organisation, depending on what triggered the need for IT strategy planning in the first place — DP application backlogs, technical or organisational incompatibilities, new technological opportunities, proposed new business ventures and so on. The tools or subset of tools appropriate for a particular strategy study will therefore vary.

As a guideline, organisations pursuing a strategy to achieve competitive advantage are likely to find that the tools described under activities 2, 3 and 5 the most relevant. Organisations pursuing a more 'traditional' approach to IT strategy planning are likely to find activities 1 and 4 more appropriate. Activities 6 and 7 are applicable to either approach.

It is unlikely that any organisation will wish to use *all* the tools we describe in the normal course of a particular strategic planning exercise (except perhaps where a fundamental restructuring of the organisation is to be accompanied by a similarly radical restructuring of IT resources). However, regardless of the main emphasis of a specific strategic planning

Figure 3.9 Framework of IT strategy planning activities and tools



exercise, it is worthwhile to consider at least in outline all the five business and IT factors, to ensure against possible missed problems or opportunities. Selectivity is therefore best if it is of degree, not kind.

The first five activities — identifying the business and IT factors — need not be undertaken sequentially but can often be carried out in parallel. It is also worthwhile noting that obtaining agreement and reaching decisions on the proposed strategic direction (activity 6) may be required before the activities associated with ascertaining business and IT factors are fully completed. The tool that we discuss for achieving consensus and decisions is a structured management decision workshop. Such a workshop is an almost purely political tool. Judging the right timing for it will therefore depend on political considerations. Indeed, for the same reason — and to maintain commitment — more than one such workshop may be required during the planning process. The elapsed time over which the planning process will stretch depends obviously on the kind and size of the organisation, and the consequent scale and scope of the project. But it also depends on the extent to which the organisation is accustomed to IT planning and the extent to which the relevant business and IT factors are already understood, assessed and recorded. In practice, the process can therefore last from a few weeks to many months.

PLANNING ACTIVITY 1: ASSESSMENT OF BUSINESS NEEDS

As we have stated before in this chapter, business objectives should be an important determinant of an IT strategy. However, for IT planning it is necessary to understand only in global terms what these objectives are. What is important is to ascertain how the objectives are to be achieved, because IT is one possible means of achieving them. Also, in organisations that are subject to fast-changing environments, objectives are likely to change as fast. But as far as IT is concerned, the means of achieving those objectives could well be similar or even identical.

Therefore, simply asking business managers what their requirements are is likely to be enough only where there is a high degree of certainty about the longer term direction of the business and the role of individual business units. Where this is not so, the requirements need to be synthesized more formally. A tool for this purpose is the Critical Success Factors method.

Critical Success Factors (CSF)

Writing in 1961, D. Ronald Daniel first introduced the concept of success factors. He stated:

"....a company's information system must be discriminating and selective. It should focus on success factors. In most industries there are usually three to six factors that determine success; these key jobs must be done exceedingly well for the company to be successful".

The concept was taken up by various workers, including Dr John Rockart of the Sloan School of Management at the Massachusetts Institute of Technology.

The CSF method for eliciting users' requirements is based on structured interviewing techniques. Managers (or other key users) state not only what their business ojectives are, but the factors that are critical in achieving these objectives. Figure 3.10 illustrates the items that are typically covered in a CSF interview. It is important that these interviews, which are normally face-to-face between the planner or researcher and the relevant business managers, should concentrate on business rather than IT requirements, even if most interviews will inevitably include possible IT solutions too. Each CSF interview must be written up in a structured form and returned to the manager interviewed for checking. Once all CSF interview summaries are available, they are analysed as a set.

CSFs should fit into a hierachical structure, so that a CSF for a senior manager in one branch of the organisational hierarchy is supported by a CSF of one or more subordinate managers in the same branch. In the same way, information requirements associated with the CSF are consolidated in a hierarchical pattern. It is normal to find some anomalies in the process which need to be investigated and reconciled.

The end result is a consolidated picture of the CSFs of the organisation and its business units, together with the information requirements associated with the CSFs at the various levels within the hierarchy.

The CSF method is generally so successful because rather than 'averaging out' requirements, it recognises that each business unit has different objectives and uses different means to achieve them. It also

Figure 3.10 Typical flow of a CSF interview

- Purpose of manager's job
- The objectives of his or her business unit, both general and specific
- The factors that are critical to achievement of objectives
- Their sequence of importance
- Information required to monitor CSFs
- Information currently used and relevance to CSFs

recognises that each CSF is part of a hierarchy of CSFs, which reflects the priorities of different levels of the business.

CSF is also a useful technique when there is no business plan that states business objectives explicitly. In such an instance the IT planner will need to look at what managers actually do, to link the plan to genuine objectives. It is also a useful method for prioritising needs when there are only limited resources available.

PLANNING ACTIVITY 2: COMPETITIVE ANALYSES

The previous activity is very much focused on identifying business needs, as *internal* business managers see them. By looking at the company as part of the marketplace, *externally* determined threats and opportunites are identified, which may affect the company's relationships with its business partners.

We have discussed the competitive forces that can affect any organisation and the possible responses to these that it may use, in the previous chapter (pages 13 and 14, respectively). An assessment of possible competitive advantage applications requires firstly a focused research effort that ensures the relevant competitive forces and the organisation's possible responses are objectively considered. But this is only one requirement, as we shall see below.

Effective research will lead to an understanding of the structure of the organisation's business and the exchanges of information that make it work. What knowledge is communicated by divisions and functions of the enterprise, to make the business happen? What knowledge does the organisation share with suppliers, customers, trade bodies? Many of the information exchanges will be adequately served by existing data processing or communication systems. Once checked that they are, they can be forgotten. Out of the remainder, some will begin to emerge as candidates for a competitive-advantage application. In the past they will have been neglected for a variety of reasons. Quite likely they were ignored because the organisation could not see how to include other organisation's employees in its systems. Other opportunities will have been ruled out because they seemed in the past likely to be too costly to seize. Some opportunities will have been ignored because the technology to exploit them was simply unavailable.

The list of candidate applications derived from the research will be sifted down from hundreds to dozens, and from dozens to a handful. There are probably many ways of carrying out this process of refinement. To assist the planner in ensuring that the research is focused yet comprehensive in including and considering the relevant factors, our method uses structured criteria and forms for evaluation that direct the research and record its results.

For example, Figures 3.11 and 3.12 illustrate the principles. Suitably modified and added to, thus reflecting each organisation's positioning in the market, the method provides an analytic framework for focusing the research for competitive-advantage applications.

Figure 3.11 provides a form that serves both as a checklist to identify threats from different types of competitors using different strategies, and a way of prioritising possible IT responses to competitive threats. The first two columns provide a summary checklist of competitors and their strategies. The second two combined, provide an indication of the extent to which IT can be a major element in developing a strategy to respond to the activities of competitors. It may be necessary to put a timeframe

Figure 3.11 Analysis of the impact of competitive forces

Competitive force[1]	*Type of strategy of competitor*[2]	*Impact or possible impact on organisation*[3]	*Relevance of IT as response to competitors*[4]
Traditional rivals:			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
Suppliers:			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
Customers:			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
New entrants:			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
Substitutes:			
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

Notes:

[1] Under this column the organisation's competitors are listed by name or, if this is not possible or practical, by generic group (eg major banks, small software houses, etc.).

[2] Here the strategy adopted or likely to be adopted by competitors is identified — ie differentiation, niche markets, reducing costs, trading partner lock-in, new business creation, new business practices — see page 13 for description.

[3] Here the impact of competitors' activities is rated, say on a scale from 1 to 7 where 7 is the most critical impact.

[4] Here the extent to which IT can be used as a tool to respond to the competition is rated, again say from 1 to 7.

*The highest combined score of columns 3 and 4 will indicate where IT is most important as a tool to respond to competitors' activities.

on the assessment of the impact of these factors and the relevance of IT as a tool for responding to them — say five years or so.

Figure 3.12 uses a similar principle to match generic technologies to opportunities for responding to competitive forces and for assessing their suitability. It uses the value chain of an organisation to provide a framework that checks for possible missed opportunities.

However, because of the nature and potentially high risks of competitive-advantage applications, a purely analytical research effort by itself is unlikely to yield a strategy that is both sufficiently novel, yet feasible, at a risk level acceptable to management. Research is only the first step in the search for competitive-advantage applications.

More than any other type of IT strategy, a strategy to obtain competitive advantage needs the support and commitment of management. While research can provide ammunition to gain that commitment, it will rarely be enough. Therefore, we believe it is imperative that the opportunities analysed during the research phase are openly discussed, assessed and reviewed face-to-face by the managers concerned, for example in a management decision workshop — a tool we discuss on page 37.

Figure 3.12 Matching generic technologies to application opportunities

Key generic technologies / *IT applications opportunities*	*Cellular radio*	*Portable PC*	*Videotex*	*Cable TV*	*Interactive videodisc*	*Expert systems*	*Smart card*	*Etc.*	*Etc.*			
Inbound logistics .... (eg allow suppliers access to parts of company database)												
Operations .... (eg integrate manufacturing)												
Outbound logistics .... (eg speed up deliveries)												
Marketing and sales .... (eg get sales staff to spend less time in office)												
Service .... (eg provide 24-hours-a-day service)												

Rating: 3 = excellent match
2 = good match
1 = reasonable match

Note: Completely unsuitable application/technology matches would have been excluded during the research.

PLANNING ACTIVITY 3: PEST ANALYSES

PEST factors are *p*olitical, *e*conomic, *s*ocial and *t*echnological factors. They may have an impact on the company as serious or more serious than those of competitors. In a sense they are therefore also competitive forces, but they affect the organisation's competitors alike. The key is to respond to these factors earlier or better than competitors.

The principles for assessing PEST factors and possible responses available to the organisation are in essence similar to those used for competitive analyses. We provide in Figure 3.13 an example of an

Figure 3.13 Analysis of the impact of PEST factors

External (PEST) force[1]	*Impact or possible impact on organisation*[2]	*Relevance of IT as response*[3]
Political:	....	....
Economic:	....	....
Social:	....	....
Technological:	....	....

Notes:

[1] Under this column the PEST factors are itemised (eg deregulation of financial markets, new trade barriers, greater proportion of women as workforce, robotics technology).

[2] Here the impact of the PEST factor on the organisation is rated, say on a scale from 1 to 7, where 7 is the most critical impact.

[3] Here the extent to which IT can be used to respond to the threats or opportunities of PEST factors is rated, again say from 1 to 7.

* The highest combined score of columns 2 and 3 will indicate where IT is most strategic in responding to PEST factors.

assessment form that may be used to identify and evaluate PEST factors and the role of IT in responding to the threats and opportunities presented by these factors.

PLANNING ACTIVITY 4: ASSESSMENT OF EXISTING IT FACILITIES

For this activity two types of input may be required. Firstly, an outline inventory of the existing IT resources of the organisation — human, technical and financial — is needed. However, in addition it may be appropriate to assess how well these resources actually match user requirements.

Inventory of IT resources

An inventory of existing IT facilities can range from the most cursory of reviews to complete detailed audits. For the purposes of strategic planning it is necessary to have only a global view of the capabilities and constraints of an organisation's existing IT resources.

This needs to be available at three levels:

— Human: The manpower resources, their skills and experience and how and where in the organisation they are deployed. Particular strengths, as well as weaknesses, of the IS function must be identified to ensure the organisation exploits its human IT assets. Also included would be management control procedures and methods for allocating priorities.

— Technical: An outline inventory of current computing hardware and software, and telecommunications facilities is needed. Most organisations will have this readily available for the central IS function, but where IS responsibility is distributed collating the information may require extra work.

— Financial: The current and planned level of expenditure on IT of the organisation will be known accurately by few organisations. Definitions and accounting practices will vary and distributed IT systems may not always be fully accounted for.

However at least an order-of-magnitude understanding of the levels of expenditure is required. This is not necessarily to constrain the IT strategy, but to allow top management of the organisation to evaluate IT solutions in comparison to others.

An assessment of how well these resources match user requirements is often done informally. Some organisations have good communication between their IS functions and their user departments. However, especially in large organisations or in groups of companies, the sheer number of business managers often means that it is not possible to obtain a balanced view from all of them in informal ways. Also, informal methods often lead to the demands of more powerful users to be met with greater urgency than is perhaps warranted by their business case. A more objective way of assessing user needs is based on formal surveys or interviews. We describe one example: the User Needs Survey (UNS) developed by Dr Bob Alloway.

User needs survey

A user needs survey would divide into two parts. The first part is concerned with identifying and recording the needs of the business. These may already be explicit. Alternatively they need to be ascertained, for example by using the CSF method outlined above.

The second part of a user needs survey is based upon a carefully designed questionnaire which is completed by a representative sample of managers, typically 200 or more. The questions are designed to obtain a wide range of data about users' needs and about the attitudes of both user managers and systems managers to the systems service. For example, some of the factors covered could include:

— The levels of systems support for important decisions and key tasks, and the requirement for new or improved systems.

— The availability and responsiveness of the computing service.

— The quality of communication between users and systems staff.

— The technical quality of systems.

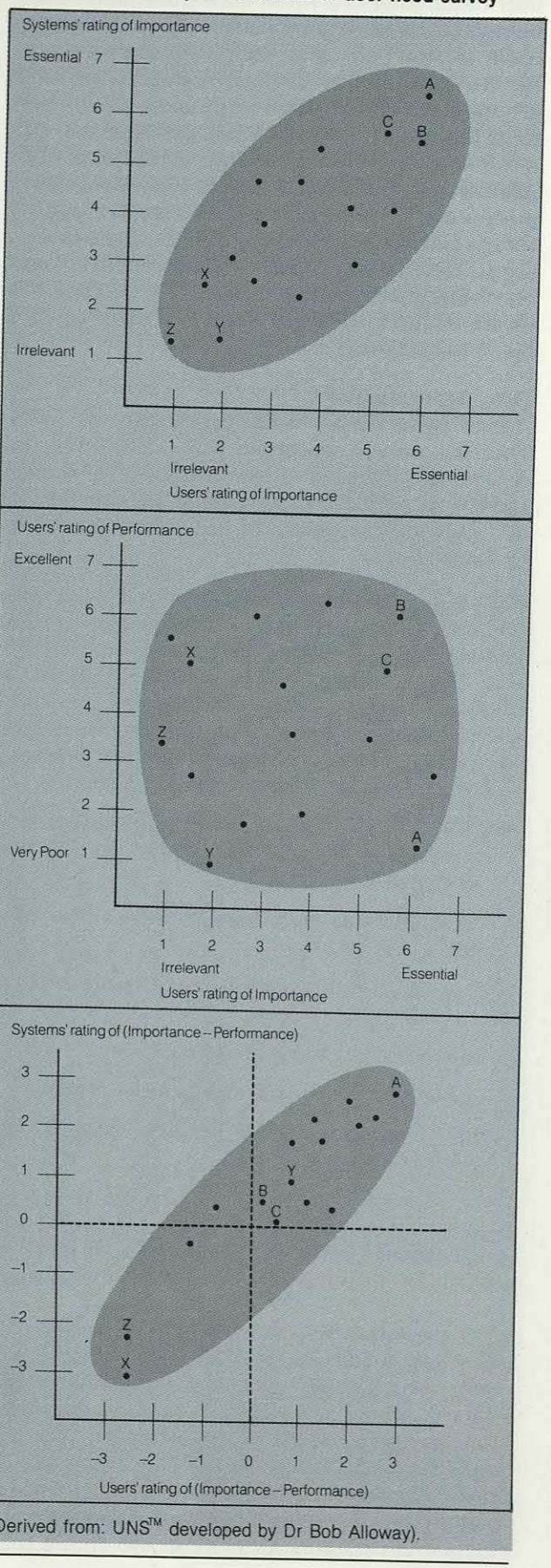
— The level of responsiveness to users' needs.

— The suitability of the systems organisation structure.

The survey sample must be drawn to ensure representation of all functional departments or business units, all levels of management and all degrees of system user from the full-time user to the non-user.

All of the survey data is analysed statistically, and the results can be presented in a wide variety of formats. For example, one analysis might show the importance of a range of factors as assessed by both user managers and by systems managers. For example figure 3.14 (top) on the next page, shows those factors that they regard as important (factors A, B, C) and those that they regard as relatively unimportant (factors X, Y, Z). It also shows that

Figure 3.14 Examples of results of user need survey



(Derived from: UNS™ developed by Dr Bob Alloway).

there is good agreement between users and systems managers since the results are highly correlated. The same format could be used to depict performance rather than importance.

A second analysis might show how user managers assess both the importance and the performance of the range of factors. The ideal picture would show that the measures were closely correlated, with the most important factors showing the highest performance. Instead, the diagram in our example (Figure 3.14 middle) shows that there is very little correlation. Two highly important factors (A, B) have widely differing performance levels. Two factors that show good performance (C, X) differ widely in importance.

A third analysis might calculate the differences (Figure 3.14 bottom) between importance and performance for each factor. This diagram charts these differences, as seen by both user managers and systems managers. Again in the example given there is good correlation between the two sides. The top-right quadrant shows agreement on underperformance and the bottom-left quadrant shows agreement on overperformance. Clearly, attention and resources should be allocated to the factors with greatest underperformance — at the expense of the overperformance factors if resources are inadequate.

The results of the analysis, in conjunction with the organisation's business strategy and the budget for systems activity, are used to assess the current position, to identify strategic systems objectives, to evaluate a variety of options for satisfying these objectives, and to prepare a strategic plan. At the same time, the implications of reallocating the budget, to align it more closely with the diagnosed priorities, are identified. Management can thus decide on a better trade-off of resources, systems service and user satisfaction.

PLANNING ACTIVITY 5: ASSESSMENT OF NEW IT DEVELOPMENTS AND TRENDS

Relevant developments and trends in IT need to be identified. But more importantly, the impact of these trends on the firm and on its industry needs to be evaluated. Finding out about technology is not difficult. There is more written and spoken about IT than almost any other topic in the business press. The problem is one of selectivity and time and effort required to collect and interpret the material. It is also an activity that in many organisations goes on all the time, but peaks during the planning process.

Unless attention is paid to the relevance of information technology, the planner may fall into one of two pitfalls. He may be temporarily enamoured of every new invention that is currently 'in vogue', or conversely, faced with too much information, he may go

into overload and ignore all but the well-tried and proven technologies. Either extreme, obviously, is detrimental to a plan that is intended to be a road map for the next three, five or seven years.

To assist the planner, we have developed a framework for identifying generic technologies that are likely to be relevant over the next half decade or so and should be taken into account. We described this on page 22 with a diagram that showed the maturity and impact of several generic technologies and discussed the suitability of different types of technology for different kinds of organisation.

PLANNING ACTIVITY 6: AGREEMENT AND DECISION

From the previous activities the planner will have a view of existing and likely future needs, threats and opportunities and the possible IT solutions and responses. The next activity we discuss is perhaps the most critical in terms of the success of the strategy. It involves obtaining agreement from the managers on the priorities for the IT strategy, and a decision to proceed. Whereas most of the previous steps are both analytical and political, this step is almost purely political.

One of the most useful tools in this step is a structured management decision workshop. This is a one- or two-day event that must involve all the senior managers of the firm whose businesses would be affected by the proposed IT strategy. A sample agenda for such a workshop is given in figure 3.15. The agenda shown refers to a decision workshop on competitive IT opportunities, but the principle, suitably adapted, applies equally to other occasions in the planning process that require management decision and agreement.

Typically, such a workshop involves first a presentation of the reasons that gave rise to the planning exercise and the purpose of the workshop, and the results of other planning activities. The managers discuss their individual business needs and react to the key findings of the previous steps in the planning process. By discussion, they arrive at a consensus on the overall strategic direction of IT in their organisation. Having reached agreement they then discuss specific IT options and priorities.

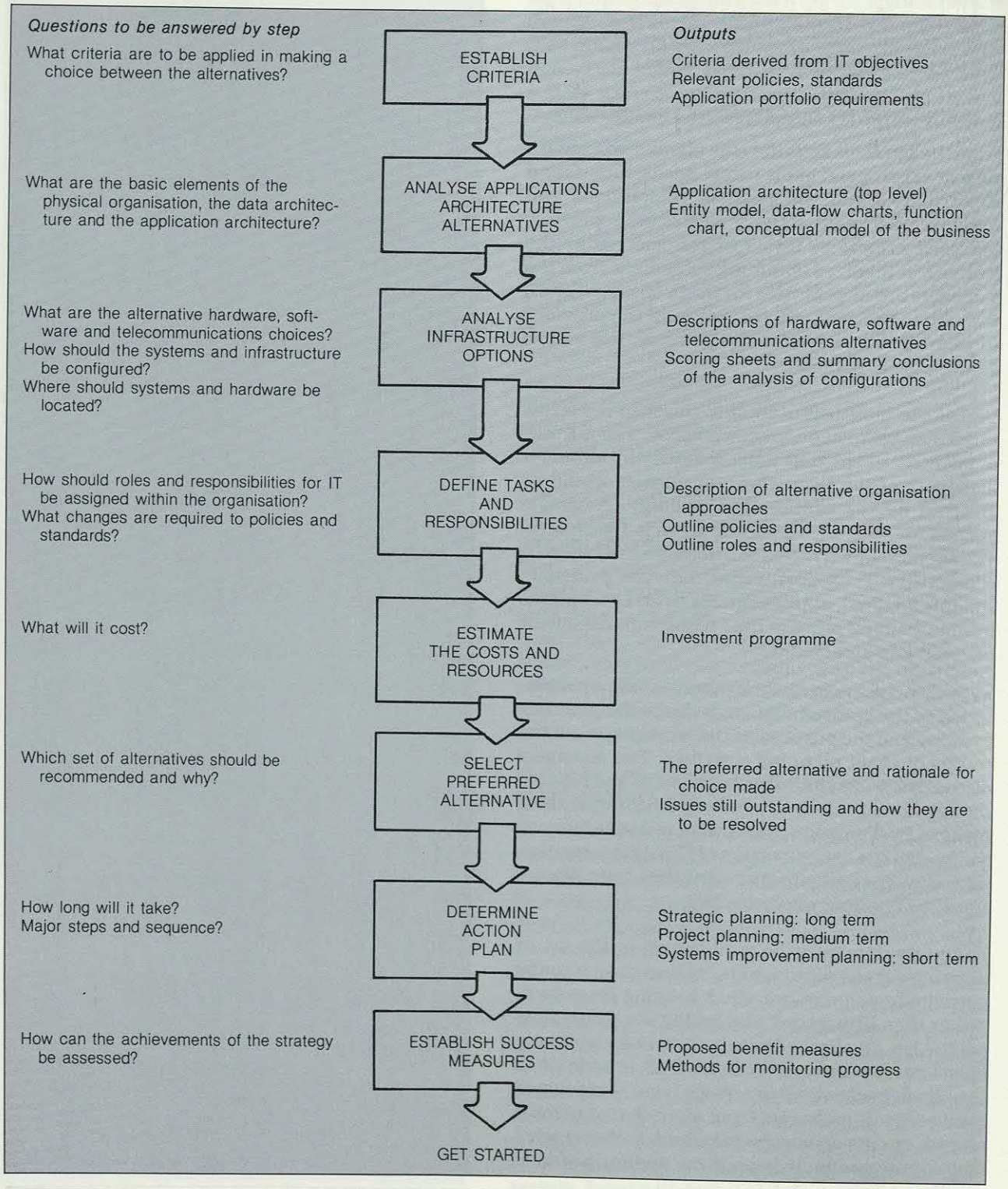
The presenters must be well versed in the art of drawing out the participants, so that they actually participate and explore what is being presented, rather than sitting back and letting the words flow past. Also, to ensure that discussion is relatively open and interactive, it is often best if, in addition to the chief executive, only a single level of managers is involved. If managers from more than one level attend, discussion may be inhibited, and excessive and counterproductive political undertones may result.

Figure 3.15 Sample agenda for a structured management decision workshop

Day One		
Item No.	*Time*	*Item*
1	Morning	Introduction: — Agenda — Background to study and workshop — Role of attendees — Competitive market and the organisation's position — Strengths, weaknesses, opportunities and threats
2		The organisation's business profile — Dimensions of the business profile — Discussion and agreement
3		Business information requirements — Business goals — Supporting information needs
	Lunch	
3	Afternoon	Business information requirements (continued)
4		Business facility priorities — Syndicate groups link facilities to business profile — Comparison of group findings, and prioritisation
	Dinner	
5	Evening	Generic technologies — Preselected technologies — Presentation of technologies in turn
6		Scenario descriptions Description of ten-year-out scenario Description of case histories
Day Two		
7	Morning	Scenario development — Syndicate groups develop five-year-out scenarios — Syndicate groups present scenarios
8		Application and corresponding generic technologies — Review of business facilities in the light of the scenarios — Associated applications — Corresponding generic technologies — Technology take-up chart
	Lunch	
9	Afternoon	System road map — System building blocks — Time-based road map
10		Year-by-year costs — Cost of system building blocks — Year-by-year cost projections
11		Next steps — Summary — Follow-up meetings and deliverables

Structured decision workshops are a powerful tool because they allow issues and opportunities to be examined, systematically and comprehensively. But a structured workshop is not a mere talking-shop; it is a decision mechanism. Hence those who participate must be able to express a degree of commitment towards the priorities that emerge. Otherwise the whole edifice will fall to the ground within days. It follows that those who participate must be the real decision-makers within the functions or business units represented. There is a sales job to be done to make such a programme feasible. Ideally the chief executive may be induced to issue the invitations to attend. It is also desirable that structured workshops

Figure 3.16 Steps in preparing the plan for an IT strategy



should be held away from the organisation's premises, to avoid interruptions and to encourage detachment from everyday problems.

Decision workshops work best in organisations that operate in a fast-moving environment and where managers can work together. Their main attraction is that they use peer-group pressure to achieve agreement and commitment. However, in some instances the organisational structure and political climate make this method inappropriate. In other instances, it may be impossible to get managers from widely dispersed geographic locations together. Under these circumstances agreement will either be obtained through one-by-one consultations — a lengthy, frustrating, and sometimes destructive method — or by decision from top management alone.

Either way, the result of this activity in the planning process is an agreed and prioritised set of business needs and IT options, which forms the basis for preparing the detailed plan.

PLANNING ACTIVITY 7: THE IT STRATEGY PLAN

The preceeding activities will have formulated the requirements and answered the questions of 'where' the organisation wants to be and 'what' it intends to do. The planner now knows what the *strategy* is. The next activity is to prepare the *plan* itself — 'how' the organisation is to put the strategy into action.

In our schematic of planning activities on page 31 we have included this activity as a single logical step. In practice it comprises a series of interrelated activities, as shown in Figure 3.16. It is important that this activity should not stray into the area of project planning, but concentrate on selecting the right overall option that formulates policies and procedures.

First the criteria are established by which a particular option or set of options will be chosen. Then follows an assessment of the options for the applications architecture and technical infrastructure. The associated organisational responsibilities, costs and resources are evaluated. From these the preferred alternative is selected and an action plan is prepared. Finally, measures are established whereby the success of the strategy can be assessed.

SUMMARY

Although most organisations accept that they need a strategy for information technology, many regard the task as a chore that is the exclusive province of the systems department. But a genuinely strategic direction for IT that reflects both the organisation's needs and the environment in which it operates, needs to involve business managers as well as systems staff from an early stage. Methodologies are useful but not enough to ensure ongoing commitment and achievement of the goals set. We believe that ultimately, as IT is increasingly regarded as a 'natural' and integral part of the enterprise, IT strategy planning will no longer be regarded as a one-off chore or task but an essential and ongoing element in business strategy planning.

Chapter 4

THE ROLE OF THE INFORMATION SYSTEMS FUNCTION

As information technology becomes an increasingly strategic tool for many organisations, and as its impact and use becomes more widespread, effective management of the information systems (IS) function becomes a more challenging task. Conversely, as the function 'grows' into the business, and becomes an integral part of it, its role is changing in fundamental ways, requiring new structures and different kinds of management.

The management of the IS function involves many aspects, at different levels, including:

- The *role* of the function as it is changing in response to new requirements, and the way its work is structured and managed to meet these requirements and achieve intended results.
- The centralisation/decentralisation issue and how the increasing *distribution* of information technology is affecting the way in which the IS function undertakes its work.
- The *relationship* of the IS function with other parts of the organisation, including top management and the users it serves.

The first of these topics is addressed in this chapter. The other two are discussed in Chapters 5 and 6, respectively.

Figure 4.1 Traditional roles of the IS function

Area of work	*Activities*
Operation of IT facilities	Data preparation and data entry Input and output controls Machine operation File storage and control Hardware maintenance Job scheduling
Development	Feasibility studies Systems analysis and design Software development Packaged software acquisition System conversions User training Application software maintenance
Support	Systems software maintenance Telecommunications support Database report
Research and planning	Capacity planning Systems planning Budgeting Systems personnel management Systems personnel training Standards development

Adapted from MIS Quarterly, June 1984

Figure 4.2 Evolving roles of the IS function

Subfunction	*Activities*
Operation of IT facilities	Operations as described in Figure 4.1 End-user facility operations support Database support Telecommunications support Maintenance (hardware, systems software and applications software) End-user liaison and quality assurance for production systems Capacity planning
Development	System design and software development for production systems, for critical systems, for sensitive systems, for corporate-wide systems, and for software tools
Support	Internal consulting service for organisational analyses, modelling, feasibility studies, and systems analysis Broker for packaged software, external data services, word processors and microcomputers End-user and systems personnel training Internal consulting service and support facilities for end user applications development via microcomputers, decision support systems, modelling languages, data inquiry systems, and automatic applications generators.
Research and planning	Monitor technological developments Plan technical infrastructure Technological forecasting Develop organisational infrastructure Investigate potential for applying new technologies within organisational areas Plan and manage system implementations Plan and manage pilot studies Overall information planning Liaison with corporate strategic planning Overall evaluation of organisational use of information systems Establishing information policies Standards development Evaluation of adherance to controls

We begin by reviewing how the role of the information systems function is changing, analysing the effect these changes have on its traditional role. We then describe the elements that characterise a good role or 'mission' statement for the function . A discussion of alternative structures for managing IS work follows a way of classifying this work that is applicable universally, regardless of the way in which that work is allocated in practice in particular organisations. This 'template' of IS work may be used to assess the contribution of the different areas and types of work to the objectives of the IS function. We conclude the chapter by describing how IS work may be organised, in response to current trends.

THE CHANGING ROLE OF THE IS FUNCTION

The role of the information systems function has changed from one of a production line to one of service. This statement perhaps best summarises how the role of the function has changed, but also how it has been *seen* to have changed. Its traditional technical image has given way to one more oriented to the business of the company.

In support of this statement, we show in Figures 4.1 and 4.2 activities traditionally associated with different areas of IS work and how they are evolving. What is striking when comparing the two figures is not so much the greater number of activities undertaken by the evolving IS function, but the much greater variety of tasks covered. It is not just that traditional activities have expanded in scope; totally new types of activities — notably those associated with telecommunications, end-user computing and office systems — are increasingly within the domain of IS.

Another important point is that the work of the traditional IS function is very much 'self-contained' and almost totally under the control of IS. In the evolving style of IS, the dividing line between it and the rest of the business is more blurred with much cross-impact between one and the other. Furthermore, the strategic role of information technology is reflected in many of the activities of the evolving IS function.

FACTORS INFLUENCING THE ROLE AND STRUCTURE OF THE IS FUNCTION

What has led to this shift in role of the information systems function? Primarily two factors: technology development and a growing recognition of the importance of information technology in almost all kinds of organisations.

Information technology has become more accessible to users as a consequence of developments in software, microcomputers and telecommunications facilities, developments made possible by significant cost reductions. Users now have choices. They are no longer totally dependent on technical experts in a specialised section of the organisation. In addition, continuing investment in information systems over the past several years means that the typical organisation now has a major stake in its systems, of which it wants to be in control. As a consequence, the information systems function has needed to react and to change its image and its relationships with other parts of the organisation.

In some organisations, the process is at a more advanced stage than in others. Figure 4.3 indicates some features of the typical maturing IS function and how it relates to the company. We emphasise that these are typical rather than universal features. It is perfectly possible, for example, for highly mature IS functions to have budgets amounting to less than one per cent of turnover, or to have only a

Figure 4.3 Features of the maturing IS function

Maturity characteristics	*More mature*	*Less mature*
Usage history	20 + years	Less than 10 years
IT expenditure (percentage of turnover)	More than 1%	Less than 1%
User awareness	Users can actively participate in systems planning and analysis, but dependent on IS staff	Users do not participate
Senior management	Involved through a steering committee or directly	Little involvement
Organisational positioning	Independent, reporting to top management	Under accounting/ finance function
IS objectives	Derived from overall company objectives in cooperation with top and user management	Set by IS manager only
Evaluation basis	Contribution to organisational priorities	Cost savings (50%) Meeting budgets (25%) User satisfaction (25%)
IS planning	Linked to business plans	Establish informally by IS manager
Control mechanisms	Charges users, enforces documentation standards, requires progress reports	Lacking: no chargeout

Adapted and updated from MIS Quarterly, March 1980

few years' system experience. However, taken as a 'package', the characteristics listed in the figure identify how the role of the IS function varies, depending on its maturity. These trends require corresponding changes in the structure of the IS function and in how its overall role is defined.

DEFINING THE OVERALL ROLE OF THE IS FUNCTION

Given this changing role of the IS function, what then must be considered when defining its role within the organisation?

A clear, concise and explicit statement of the overall role, or mission, for the information systems function and the organisational entities that fulfil it, establishes the context within which the function can be properly planned and undertaken. It expresses the focus and 'reason for being' of the function, from which subordinate activities flow. It sets the parameters by which its work is focused and its performance can be assessed. Figure 4.4 summarises the kinds of questions the role statement should address.

Any good mission statement will have certain characteristics: it should be clear and unambiguous; it should be written down and openly communicated; and it should be reviewed and, if necessary, adjusted periodically to remain in line with the mission statement of the organisation it serves.

Given, however, that the IS function is experiencing the changes we have described, there are other prerequisites for a succesful role definition:

— *Areas of responsibility must be clearly allocated.* A central issue in this respect is the kinds of system for which IS should be responsible. In the past this comprised almost exclusively DP systems.

Figure 4.4 Questions to be addressed in defining the overall role statement of the IS function

- Who are our users? Who will they be and who should they be in future?
- What do our users need and expect from information technology? What is value to our users?
- How do we best serve our different kinds of users? What kind of role should we adopt in relation to different users?
- What products and services do we offer and should we offer? Should we include consulting, training and microcomputer work?
- How should we charge users for our services? Is our charging mechanism overcomplex? Does it encourage effective use?
- Which products and services will we provide ourselves and which will we subcontract or purchase from elsewhere?

Now other areas such as telecommunications (voice and/or data), office systems (professional and/or clerical), and even manual systems are often included within the domain of the IS function.

Although 'integrated' IS departments are becoming more common, fewer organisations than has been predicted as little as two years ago seem, in fact, to be following this path. The relative merits of IS integration is an interesting subject in its own right (and it could be argued that this is a matter of policy and not of mission). It is important, however, that the mission statement should be consistent with the scope of authority and the skills of the IS function. Therefore, where different organisational entities fulfil different IS responsibilities, their mission statements must be consistent with each other.

— *The distinction between staff and service roles must be recognised.* IS functions increasingly fulfil two basic types of roles: *Staff* roles are those associated with advising top management on such matters as information systems policy and overall planning. They are those roles that are closely related to using IT to achieve business objectives. *Service* roles are those associated with operating and supporting information technology (see Figure 4.5). These two roles are sometimes seen, particularly by users, as being incompatible. Organisational separation of these two roles is becoming more common, although it almost invariably arises as a consequence of distributing IS functions to lower organisational levels.

— *The rights of users must be declared.* It is very worthwhile to be explicit in declaring the rights of users. This helps to clarify the environment within which users and the IS function operate; it also makes clear the overall allocation of responsibilities and the areas of freedom within which users can operate. Figure 4.6 is an example of an organisation's statement of user rights.

THE BUILDING BLOCKS OF THE IS ORGANISATION

Having considered the need to identify and establish clearly the overall role of the IS function, we now turn to consider the organisation of the areas of work the function undertakes, and how they contribute to its performance.

IS work has three basic components: the organisation, the information systems and the IT facilities:

— *Organisation,* ie the structures, responsibilities and human resources required to work with information systems.

Figure 4.5 Two basic types of role for the information systems function

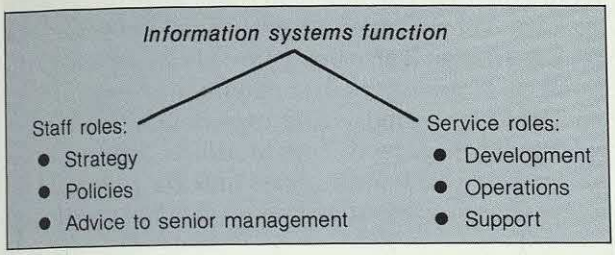


Figure 4.6 Example of a statement of user rights

User departments will have a right:

— To obtain assistance, according to their needs, from central IS skilled resources and, where appropriate, from external resources in undertaking IS work and, by so doing, delegating the undertaking of such IS work but retaining responsibility for it.

— To be treated as a client of those central organisational units that provide IS services and be able, in effect, to enter into a contract for each piece of IS work the latter undertake, which defines the cost, deliverables and timescales to be met.

— To be able to select hardware, and systems and applications software for those applications that the IS policy framework permits.

— To be able to initiate post-implementation reviews of information systems, and reviews of projects in the process of developing and implementing new information systems.

— *Information systems,* comprising:
The manual procedures and the data they require; and the applications, and the applications data, required to support the manual procedures.

— *The IT facilities* required to support applications and applications data.

There are four types of IS work:

— *Research:* The work associated with gaining an understanding of the experience with existing information systems and technologies, and new developments that are underway.

— *Planning:* The work associated with deciding how information technology is to be used to support the business.

— *Development:* The work associated with undertaking projects to implement information systems and build new IT facilities.

— *Use:* The work associated with operating and supporting the use of IT facilities — what is commonly called operations and support.

These are the basic building blocks of the IS function, shown in Figure 4.7 as a matrix. The point about this matrix is that whatever the precise way in which a particular IS function is structured and whatever methods or procedures it uses, the work can be categorised and assessed using the matrix as an overall guide. (Excluded from our consideration, at this stage, is management work — ie controlling and coordinating. Management work applies to each of the building blocks and is a subject that we discuss in the next section.)

Management can assess performance against the organisation's requirements by attaching weights to each of the building blocks that reflect their relative importance, and comparing these with ratings of actual performance. Relative importance may be established, for example, by using the business's critical success factors, which we discussed on page 32, thereby assessing the extent to which each activity does, and could, contribute to these key factors. This in turn determines where priorities of IS work need to be changed.

Specifically, management needs to determine:

Figure 4.7 The matrix of building blocks of the IS function

		TYPES OF WORK			
Components of IS work		*Research*	*Planning*	*Development*	*Use*
Organisation					
Information systems	Clerical procedures				
	Applications				
Information technology facilities					

— Who is responsible for undertaking each area of work in the matrix. This is not always clear from formal organisation charts.

— Areas of overlap of work, both within the IS function and between it and the users.

— Areas of neglect, relative to the importance of the work.

— Areas of waste or unnecessary overlap.

— Split responsibilities, and gaps in responsibilities.

— Key areas where poor performance could critically impact the business.

TRENDS AND ISSUES RELATED TO THE WORK OF THE IS FUNCTION

Having established this basic framework for categorising and assessing the contribution of IS work, we now discuss the different areas of work and the trends and factors that affect them and therefore have implications for the IS function.

We summarise in Figures 4.8, 4.9, 4.10 and 4.11 the kinds of activities typically included under the four areas of work identified (research, planning, development and use of IT systems and facilities) and the more important trends and issues related to these.

A recurring point when looking at the columns headed 'Implications for the IS function' is the need to react to shifting user demands and to growing user involvement in IT. Information systems functions have a direct involvement in the change that organisations experience as a result of the application of IT. But change is also being forced upon these functions, as IT advances in capability and ease of use, and as IT knowledge and experience become increasingly dispersed. Organisations need to keep abreast of these influences and be prepared to adapt their organisation and methods accordingly.

MANAGEMENT OF THE IS FUNCTION

The different areas of IS work we have described have management as a common denominator. We examine different ways in which IS work can be managed and allocated to the human resources that are to undertake it.

Line management and matrix management are contrasting forms of management. Line management is a hierarchical style of management, ie it involves individuals occupying a particular level under a line manager. It may be either functional or product oriented. In the functional form, work groups are organised according to the nature of the task. Under the product form, work groups are organised around end products.

With matrix management, individual staff are not under a permanent line manager, but are allocated

Figure 4.8 Research — Trends and implications

Research activities	*Trends and issues*	*Implications for IS functions*
— Keeping abreast of the organisation's own experience. — Keeping abreast of technological developments. — Keeping abreast of other organisations' experiences.	— The pace of technological development and its impact on the organisation's business. — The need to keep up with competition. — The need to rapidly progress up the learning curve, without repeating one's own and others' mistakes.	— How much to invest in research? — Whether to do research at all? — How to focus research effort. — Post-implementation reviews of new developments. — Learning from pilot projects. — Pooling research effort with other organisations.

Figure 4.9 Planning — Trends and implications

Planning activities	*Trends and issues*	*Implications for IS functions*
— Business planning — IT strategy planning — Project planning — Work planning	— The need to gain organisational commitment for IT — Wide range of interests involved at all levels of planning as IT use expands — IT planning often still taking place in a vacuum (eg if there is no formal business plan)	— Integrating IT planning with business planning — Achieving greater visibility within and, sometimes, outside the business — Educating users and top management in IT; managing user expectations

Figure 4.10 Development — Trends and implications

Development activities	*Trends and issues*	*Implications for IS functions*
— Software development	— High-productivity development tools increase productivity. — Shortage of business analysts. — Users are involved directly in analysis process. — Fourth-generation tools challenge dominance of software packages.	— Use of iterative development to replace traditional incremental approach. — Methods must support non-specialists (eg use of data dictionaries) — New tools make it economic again for IS to undertake own development.
— Hardware development	— Many more people are involved in acquisitions. — Telecommunications and office systems increasingly under domain of IS.	— Need for policies, procedures and standards to ensure compatibility — New skills required.
— Implementation	— Growing involvement of users in systems development and operations often means user is available only part-time.	— Educating users and planning their involvement.

Figure 4.11 Use of IT systems and facilities — Trends and implications

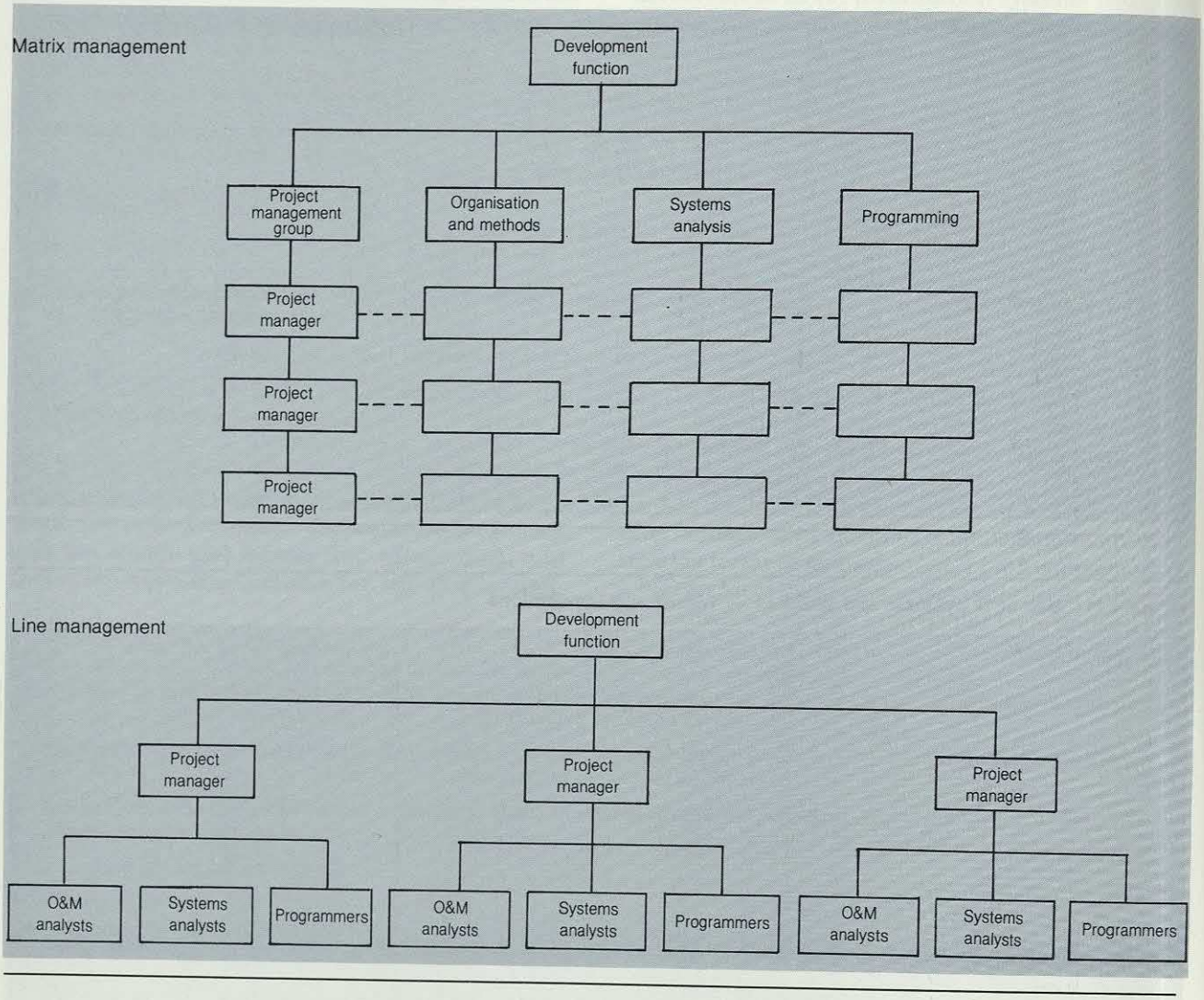
Use-related activities	*Trends and issues*	*Implications for IS functions*
— Operating It facilities. — Supporting IT facilities.	— Need for very high reliability from systems critical to the business. — User demands for support of departmental and office system facilities. — Greater use of network-based services. — End-user computing.	— Specialised user support groups (eg 'Information centres'). — Use of third parties to service remote sites. — 'Help' lines and help desks and other means of providing remote support. — User training, and provision of specialised tools. — Higher performance machines. — Contingency planning. — Duplicated (back-up) IT facilities. — Improved security to prevent both security breaches and accidental misuse.

to undertake functional work within a particular product work group, and are reallocated as existing projects end and new projects begin. Therefore, authority levels and reporting relationships change frequently. We illustrate the two approaches in Figure 4.12 on page 46 with an example which contrasts line management and matrix management for development work.

In our experience many organisations overstructure IS function management. Staff may feel that they get tied into one area of work whilst they see what sometimes appear to be more exciting and different activities in other areas. Overstructuring may also develop in excessive use of job titles and grades. Progress upwards towards line management may be seen as the only way to improve personal income, yet apparently more worthwhile work in other areas of the IS function makes a lateral move very tempting. In response to this, some organisations are trying new arrangements, not untypical of those that are found in many IT consultancies.

The approach is illustrated in Figure 4.13 on page 47. Staff are effectively the responsibility of a resource manager, who is responsible for the development of staff and their deployment to various IS undertakings under functional heads of, say, systems develpent, technical services, information centres, etc. Staff are allocated to work in one or more areas according to the needs of the areas on the one hand, and the skills of staff, their interests and their develpment needs on the other. So, for example, someone who is the prime support resource for resolving

Figure 4.12 Matrix vs line project-management



problems associated with using a particular software facility may also be assigned to a development project. Such arrangements are usually accompanied by a generic staff title, such as information systems officer, preferably free of indications of ranking significance (eg junior, senior, principal). The approach is gaining in popularity because it allows skills and resources to be deployed more effectively in a wide range of projects, and permits more flexible career paths for IS staff.

DESIGN PRINCIPLES FOR THE IS ORGANISATION

In our view, the deciding factor behind the design of any IS organisation must be the demands for effective communication with users. Figure 4.14 summarises some design principles built around the need to improve communications with users. One frequent symptom of ineffective design is a proliferation of task forces and committees. This often happens when an IS department comes to the end of a major phase in development activities and the existing relationships between users and IS staff are no longer adequate, demanding new arrangements. But in the meanwhile, committees are established to fill the gaps, often never to be disbanded, but evolving over time as circumstances change.

ORGANISATION OF IS WORK

The way in which the work of an IS function should best be organised depends upon its overall role, the scope of the work, the management and other skills available, business factors, technology factors, and the key issues and priorities that prevail at any one time.

What is obvious from this long list is that there can be no one best way to structure an IS function.

Figure 4.13 Human resource management structure

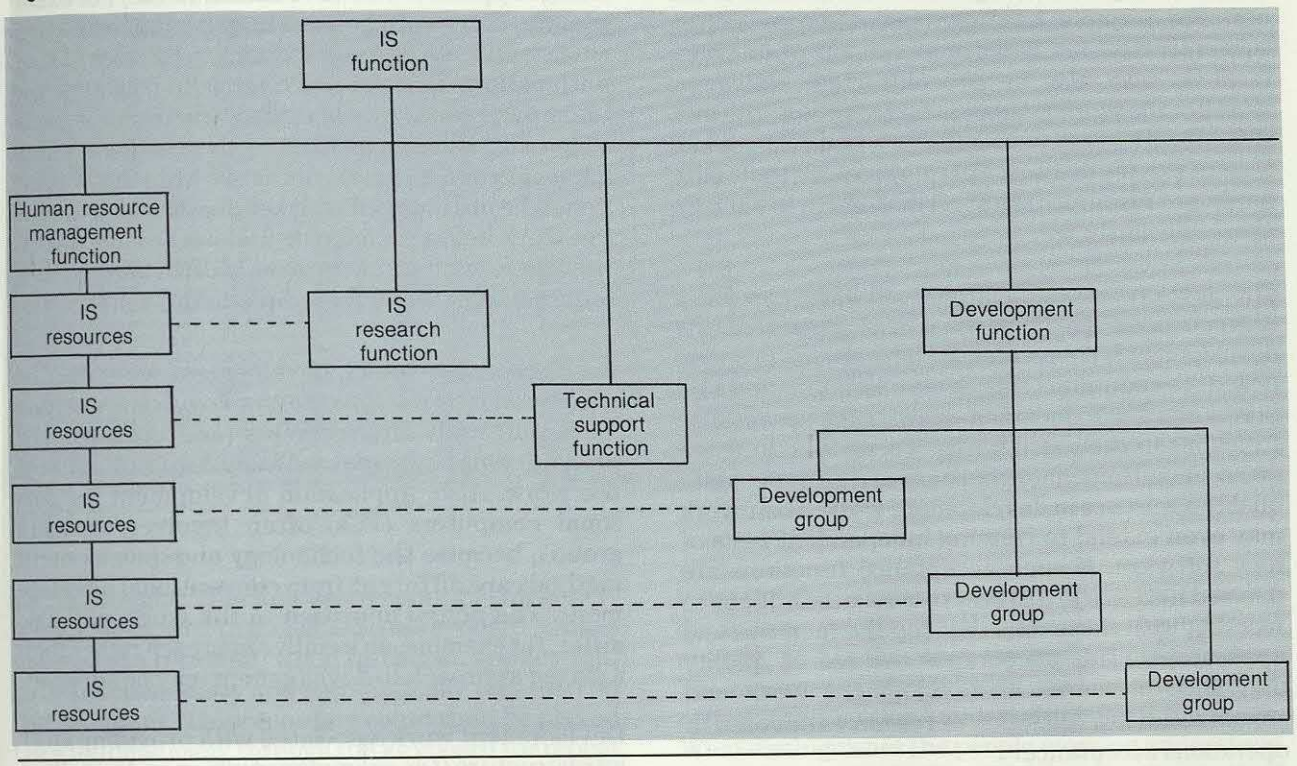


Figure 4.14 Summary of design principles for the IS organisation

- Simplify and clarify all user interfaces.
- Reduce hierarchical control and avoid the need to 'go through channels'.
- Streamline and shorten communications for all support services and production activities, including remote sites.
- Maintain a level of discretionary resources, to provide flexibility and responsiveness to changes in user needs.
- Set up group working arrangements for new developments, involving all interested parties.
- Create mechanisms to share skills and experience.
- Establish clear accountability for all critical tasks and activities.
- Be prepared, where necessary, to adapt the organisation to fit the strengths (and shortcomings) of the people it has.

However, there are some principles that need to be understood, and current trends to be borne in mind, that affect the way in which the work is structured and its quality and performance. We use the basic matrix of IS function components and types of work — use, development, planning and research — as the basis for our discussion on structuring IS work. Our main focus is on the information systems unit that supports a user community from a central position, but our discussions will also apply to large organisations that have more than one such unit, each supporting a group of subsidiary organisations.

ORGANISATION OF WORK CONCERNED WITH THE USE OF IT FACILITIES (OPERATIONS AND SUPPORT)

Work concerned with the use of IT facilities is usually undertaken by operations and support units. A typical structure of such a unit is shown in Figure 4.15 on page 48. The focus of IS units undertaking this work should primarily be one of providing agreed levels of service to users, including users within the IS function, like those who develop applications.

Operations units are generally structured according to the *type of IT resource* being operated, typically including mainframe computer operations, communications network operations, and data preparation operations. Some operations functions may also include telecommunications services, central word processing, and even photocopying services, ie potentially every common service that processes information using IT, or that is likely to be based on IT.

Support units are generally structured by *function*, eg having separate sections for operating systems, database management systems, telecommunications software, development languages and tools, etc. They may also be organised on the basis of *hardware*, where various types of hardware system are in use.

Not all the resources used by an operations and support unit may be directly within the control of the unit. For example, hardware maintenance is often subcontracted out. Some or all support of software facilities may also be subcontracted. However, whether the work is subcontracted or not, the unit should still be responsible for providing the agreed level of service to users. This may require that spare hardware resources are available onsite to back up operating hardware.

The support of applications software can be a difficult area, particularly if the quality of the development is poor. Often systems are not properly tested. To counteract this, some operations and support units have included operations acceptance functions in their structures. These functions are often the unfortunate consequence of inadequate quality assurance in development work. Their work may even extend to running independent tests of new software. If such acceptance functions are deemed necessary, it is best to direct their focus to working with those who develop the facilities and applications. This encourages the use of quality assurance measures in development work and should result in a reduction of resources devoted to operations acceptance.

Some operations and support units have also taken on responsibility for maintaining applications, ie fixing applications faults and undertaking minor enhancements. This is seldom likely to prove effective. Detaching maintenance work from the organisational unit responsible for the original development of applications tends to discourage the right attitude to quality and quality improvement in the development area.

ORGANISATION OF DEVELOPMENT WORK

Most often development work is organised to reflect the *structure of the business* it is supporting, an approach that encourages continuity of support for users. An *application* orientation is also found, particularly when there are a number of business units being supported who have similar needs. For example, different retail chains may be supported by a single application group working in the area of shop automation. This approach tends to fragment and undermine continuity of contact with users. It is possible to offset such difficulties by creating account managers or customer contacts within the IS function, who are charged with keeping in touch with all the work being planned or undertaken for a user. However, such a role is often a difficult one, as it requires someone who is diplomatic, yet forceful.

Another way in which development work may be structured is by the *type of technology* it is concerned with. Different environments (and primarily the programming language used) may require division of the work. Also, application development for personal computers (PCs) often involves separate groups, because the technology and development methods are different from conventional development. The actual approach to the work may also differ; for example, an iterative approach rather than a staged approach to development may be adopted.

Development work associated with providing an IT infrastructure (for example acquiring and installing hardware, or acquiring and installing a new database management system) is often kept separate from other development work, principally because this type of work is undertaken less often and requires different skills. It may even be undertaken by those who support currently installed IT facilities. In this case, both support of current IS facilities and infrastructure development may be the responsibilities of one organisational unit, which is separate from both operations and other development work. This is often called Technical Services (see Figure 4.16).

Some IS functions have small sub-units attached to their development units whose role is to derive aids that will help development work, and have found them to be worthwhile. For example, Hewlett-Packard's office automation development group has

Figure 4.15 Typical structure of an operations function

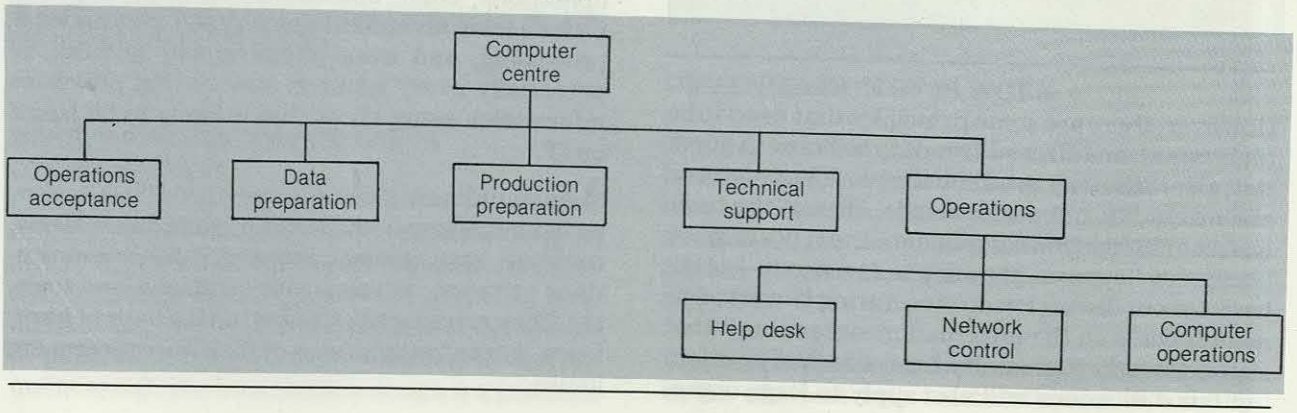
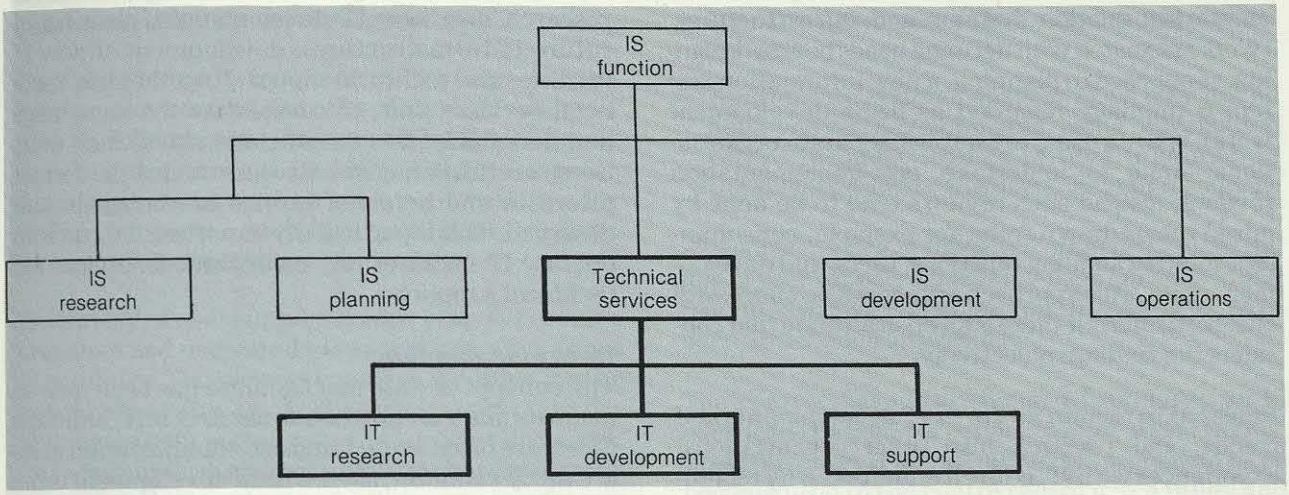


Figure 4.16 Technical services function



such a sub-unit. That unit was responsible for generating a 'black box' that enabled the keyboard strokes entered at a terminal, when testing an application, to be independently and automatically recorded on the computer. This recording could then be played back automatically through the keyboard for repeat testing. It could also be used to simulate multiple users, in order to assess performance of the systems under high-use conditions.

The trend towards multi-disciplined development units

Some organisations have brought different aspects of development work together into one unit. This encourages the deployment of a mixed set of skills to address all the ramifications of change, and it promotes a diffusion of knowledge and skills between the disciplines. It also encourages better use of the human resources available and makes it easier to manage the work. The term 'business analyst' denotes people who undertake multi-disciplined work. Such people may be expected to work at various levels, from the strategic down to the level of identifying requirements in detail and designing new information systems in non-technical terms. The managers of multidisciplinary units need to have a broader understanding of development work than would be the case, for example, for a manager who is responsible for the development of the technical part only of new information systems.

Few organisations still split analysis from programming under separate functional heads, but the level at which these two areas of skill are brought together does vary. The trend is increasingly towards combining these two skills in one person — the analyst/programmer — but this is often realistic only when fourth-generation languages are used as development tools.

What the above indicates is an overall trend to multi-disciplined people, at the one end the business analyst, and at the other the analyst/programmer. The emergence of new titles, such as 'information officer,' and 'system builder' also reflects this trend. What distinguishes the people working under these generic titles is not the discipline (ie the *vertical* dimension) but the level and breadth of skill and experience (ie the *horizontal* dimension). The higher the level of skill, the more that person is likely to be involved in overall planning of information systems. The lower the level, the more the person is likely to be engaged in detailed development work. It is unfortunate that good business analyst skills are often hard to find. However, we believe that the situation is likely to be improved as user management positions increasingly become filled by people trained and experienced in this work.

ORGANISATION OF RESEARCH AND PLANNING WORK

Most planning activities include an element of research and we therefore discuss research and planning work together.

In particular, the research work that identifies requirements is usually undertaken by those responsible for planning information systems. Often, this is done by users or by a combination of users and senior business analysts set up as an organisational unit specifically to undertake this work. Such a unit may also act as an internal consultancy available to assist users on a variety of IT matters. Indeed, this work is increasingly dominated by users, and this is usually a good thing, provided there is an appropriate framework for planning, proper training and adequate guidance on standards.

Researching the organisation's own experiences with information systems and technology includes

what IS functions call post-implementation reviews, but also the work undertaken to identify needs for future information systems and infrastructures. (Work associated with defining needs before designing, as opposed to planning, a new information system is normally regarded as being development work). It is not usual to establish separate organisational units to undertake post-implementation reviews; instead such reviews tend to be done by mixed teams drawn from, for example, consultancies, internal auditing functions, users, and development units. This approach is generally a successful one, particularly if there is an open attitude that considers the findings objectively.

Research to remain aware of IT developments and trends, and research into other organisations' experiences with IT, is often undertaken by technical services units, but this can be ineffective and requires measures to ensure that those engaged in developing information systems are kept informed or, preferably, join in the research.

SPECIALIST IS UNITS

Some organisations have IS units that are responsible for specific specialist tasks. We discuss four common such units, namely quality assurance, technical services, data management units and user support centres.

Quality assurance

Many organisations, particularly those that use formal development methodologies, have established formal quality assurance (QA) functions. QA positions may be found in several places. For example, there may be a QA function in technical services, overseeing the adherence of projects to system development standards. There may also be quality assurance positions in the development area itself.

In some organisations (eg IBM, Hewlett-Packard), and particularly in those that have implemented quality programmes from the top of the organisation, quality managers have been established, who report directly to the head of the IS function. Usually such a quality manager has no direct resources, but is engaged through communication with line managers and training programmes in promoting measures to improve the quality of work on a broad basis. Such measures typically include identifying measures for quality, reporting quality performance and initiating quality circles. Organisations using such arrangements have generally found them very successful in improving both attitudes to work and the quality of work.

Technical Services

In our discussion we have already referred to the role of technical services in passing. Many organisations prefer to bring all the technical IS skills (eg research into new IT developments, planning of future IT infrastructures, development of new IT facilities and technical support) together in a Technical Services unit, to consolidate the knowledge and make effective use of these skills. Such units need careful management to ensure that the correct priorities and levels of service are being set and observed. This is particularly important if those who operate IT facilities rely on Technical Services for technical support.

Data management

The concept of data management has been slow to make its mark on organisational structure, although facets are often seen. Database administration units are fairly common, sited within development units or within Technical Services functions, particularly if their installation and subsequent support is technically demanding. Data administration units, concerned with the definition of data and its architecture, are also found — sometimes within the development area, and sometimes associated with units engaged in planning, which may, in turn, be sited within user organisations.

The quality of data management, and the organisational attention it receives, will be related to the quality of information systems planning. The objective of the data management function is to ensure that data is used effectively throughout the organisation. As a general rule, it is therefore best centralised. Figure 4.17 lists typical responsibilities of such

Figure 4.17 Responsibilities of a centralised data management function

- Monitoring the overall data needs.
- Building and maintaining an overall model of the data needs.
- Supporting overall planning of the systems environment.
- Approving systems development plans with regard to data needs.
- Ensuring that data management roles and responsibilities are identified.
- Specifying approval criteria for authenticated data.
- Liaising with divisional and regional data management functions.
- Approving suitable methods and techniques.
- Ensuring that data analysis follows set standards.
- Providing expertise as appropriate to support local data analysis exercises.
- Ensuring that data definitions are standardised, accurate, appropriate and properly documented.
- Carrying out data audits.

a function. Because it is a coordinating function, senior management must ensure that its authority is consistent with its level of responsibility.

User support centres

User support centres are often called information centres, following the name used by IBM when it launched the concept in 1977. Other computer manufacturers have their own nomenclature for similar concepts, such as 'executive support centres', 'solution centres' and others.

Essentially, a user support centre is an IS resource organised and dedicated to support users in various IS activities. The centres combine facilities for the development and use of IT facilities, set up to use automated data and easy-to-use tools for end users. They may have their own computer hardware, and often include timesharing facilities on mainframes and microcomputers.

Our research indicates that well over 75 per cent of large organisations now have some form of user support centre. But their purpose and way of working is changing. Originally, they were set up for a variety of purposes:

- To enable users to learn about computing and the facilities that are available, bridging the gap between IS and users.
- To make data more easily and flexibly accessible to users, thereby improving the executive decision-making process.
- To create order amid the chaos of proliferating and unsupervised personal computer acquisitions.
- To devolve part of IS to end users, thereby freeing data processing staff to clear backlogs and to work on projects requiring more complex and sophisticated skills.

In practice, information centres seldom achieved these objectives as intended. For example:

- As users learn about the potential of IT, their demands for more and better facilities increases, often placing a growing, not reducing, demand on IS.
- Management of data is not straightforward. This can range from difficulties caused by the proliferation of frequently duplicated private data, to difficulties in making efficient transfers of data, say, from databases that support operational systems.
- Appropriate systems analysis skills may not be deployed in developments using information centre facilities, leading to poor utilisation of the facilities and of the users' human resources.

As a consequence of these and other difficulties the role of user support centres has been questioned and redefined in many organisations. In some, they have been abandoned altogether.

The centres have also changed from being an IS overhead to a paid-for service in most organisations. This transition is not always easy: users who have become used to the centre regard it as a utility and not as a service for which they have to pay, particularly if they are accustomed to paying for computer processing time, but not for the consultancy and training service provide by the centres. Nor is it easy to calculate the benefits of an information centre precisely, as these may accrue in very different parts and at different levels within the organisation. Also, benefits both expected and achieved will be different for a mature information centre than for a newly created one. Despite these difficulties in establishing an adequate basis for recovering costs, we would recommend that any user support centre should charge for its services, perhaps with the exception of initial training. This will help not only to recover the — often substantial — costs of operating such centres, but also put a value on the time of users who use them.

SUMMARY

The role of the IS function has not only changed but has been seen to have changed. As the limits of its domain have shifted and become more blurred, its contribution has become intimately tied to the contribution in other parts of the business. The evolving IS function requires new and broader skills, a careful mission statement that defines the parameters for measuring its contribution to the business, and more flexible ways of managing and organising its work.

Chapter 5

THE ORGANISATIONAL IT INFRASTRUCTURE

Developing a common IT infrastructure that adequately serves all parts of the organisation has become more difficult in recent years. The issue of whether to decentralise or centralise responsibility for the IT infrastructure is an old, but unresolved question for many organisations. It has become considerably more acute with the increasing diffusion of IT throughout organisations, coupled with the trend for organisations to decentralise into several operating units, each with separate operational and profit responsibility.

The arguments for centralising IT usually centre around efficiency arguments resulting from economies of scale. They also emphasise that where IT is centralised, control over data is clear, avoiding confusion and overlap of responsibilities. Arguments for decentralising, on the other hand, emphasise that current technology and cost trends reduce the need to have large computers to achieve economies of scale, and that decentralisation allows responsibility for IS to be devolved to users, who are ultimately responsible for delivering business results.

In this chapter we first discuss the factors that encourage the distribution of IT throughout organisations, including the adoption of organisational structures based on strategic business units. Because the centralisation/decentralisation issue is multidimensional we then discuss the trends and options under four headings:

— Computing.

— Telecommunications.

— Corporate data.

— The distribution of the IS function.

These reflect different aspects an organisation needs to consider when choosing its IT infrastructure.

THE TREND TOWARDS THE DISTRIBUTION OF INFORMATION TECHNOLOGY

Many factors are encouraging distribution of IT work, the principal being:

— An ever-improving price-power relationship of the technology.

— Easier-to-use IT facilities.

— Increasing dispersal of knowledge of, and experience with, IT among users.

— Lack of responsiveness (actual or perceived) from central IS functions.

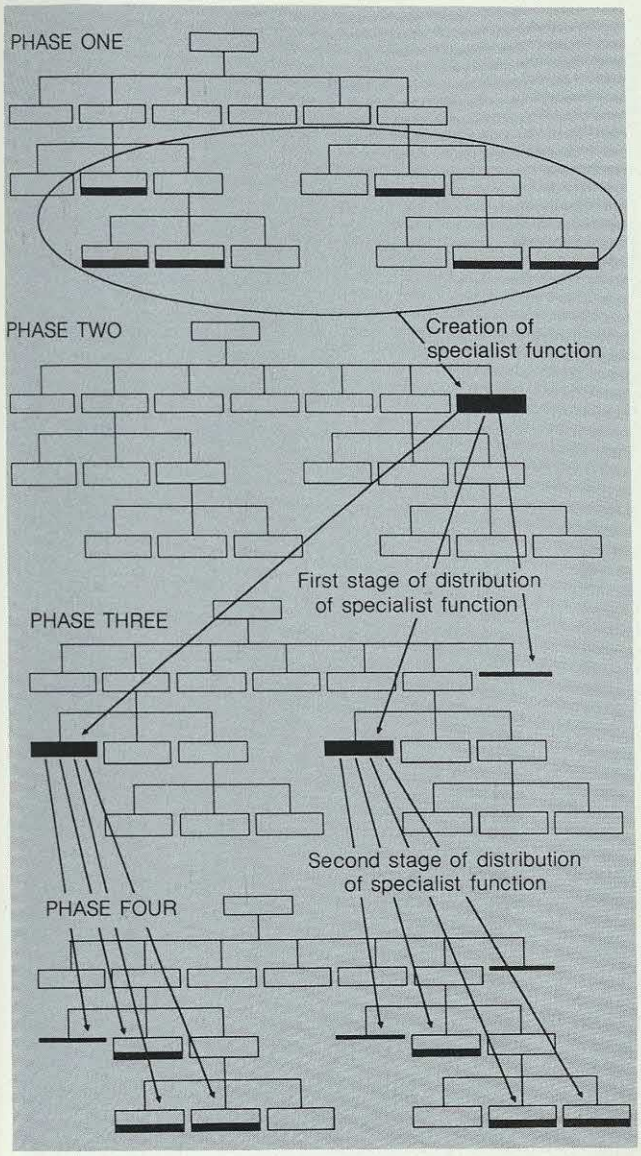
— Increasing recognition that users are better placed to understand users' IT needs than technically oriented people.

The trend is consistent with the general pattern associated with the dispersal of knowledge and with concepts associated with achieving quality. In an ideal world everyone would have the full range of skills and experience to fulfil his or her responsibilities, so that organisations could be structured logically, resulting in more complete jobs and minimum fragmentation. However, in practice, there are areas that require specialist attention, and so specialist functions like IS functions are created to handle the area of concern. The creation of specialist IS units is also encouraged by technological factors, particularly when organisations wish to achieve economies of scale, such as were once associated with mainframe computers.

By creating these specialist units, an organisation gains, in the short term, improvements in the quality of work done and it realises economies of scale. However, effectiveness in the longer term may be weakened. Rather than being seen as a temporary measure, specialist units tend to become permanent features of the organisation. By encouraging the dispersal of the specialist knowledge, technology permitting, a return to a more effective organisation is possible. Some element of the specialist activity may be retained at a higher organisational level in order to provide coordination of dispersed activity. At any point in time, some activity may be emerging that requires specialist attention, whilst others should be in the process of being dispersed. (Figure 5.1 illustrates the shifts that can occur in organisations.)

A good illustration of the concept is provided by manufacturers of computer systems. Typically, a

Figure 5.1 Shifts in the dispersal of specialist IT functions



manufacturer would have set up a specialist function to receive, from manufacturing centres, the units that made up a complete computer system and to ensure that the complete system operated properly before it was shipped to the customer's premises. This added to the cost but ensured the system worked. However, some manufacturers have now completely eliminated the specialist function, making it the responsibility of the producing units to ensure that the equipment works and that it arrives at the customer's premises within a specified time window. This focuses attention on quality at the source of the product rather than being elsewhere, resulting in an overall improvement in effectiveness.

BUSINESS UNIT STRUCTURE

This trend towards a greater delegation of responsibility is reflected in the growing number of organisations structured on the basis of individually accountable business units.

There are two basic types of organisational structure at the two extremes of a continuum along which a particular organisation may be placed. At the one extreme is the functional structure, which breaks down at its highest level into functional divisions, each undertaking unique areas of work (eg personnel, marketing, manufacturing). At the other extreme is the structure that breaks into self-contained strategic business units (SBUs), each having the full range of activities necessary to carry on their business. The SBUs may be split on the basis of product, geography or customer type. The basic communications patterns that exist in these two types of structure are illustrated in Figure 5.2 on page 54. The essential difference between the two is that there is a considerable amount of lateral communication in the functional structure whilst the communication in the SBU structure is only upward and downward, and of a more limited kind, usually relaying only information about performance and overall direction.

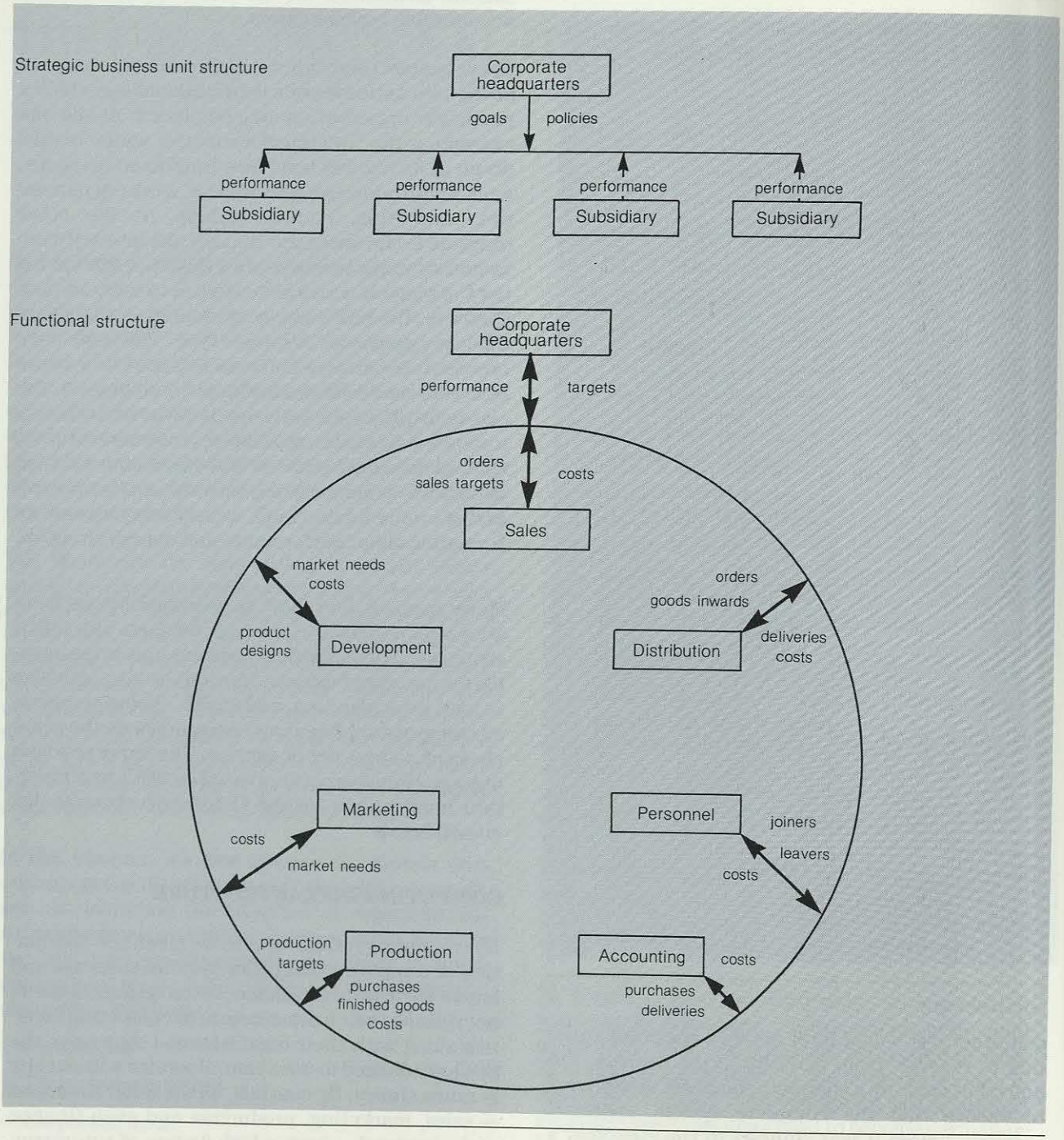
Many medium and most large organisations have adopted some form of strategic business unit (SBU) structure. The individual business unit is responsible for its entire business, from day-to-day activities to long-term planning, and an SBU would comprise all the necessary functions concerned with the value chain of its product or service. The move towards organisational structures based on SBUs has important implications for the IT infrastructure as discussed below.

COMPUTING INFRASTRUCTURE

By computing infrastructure we mean the distribution of computing and office systems software and hardware in an organisation. Often organisations do not rethink their infrastructure of computing facilities along with their organisational structure: the SBUs are obliged to use a central service without any genuine choice. By contrast, all the other functions — sales, marketing, production and even finance and personnel — have a high degree of autonomy. We are not saying that using a central computing facility is necessarily inappropriate. What we are saying is that the SBUs should be allowed to regard IT in the same way as they regard all their other resources and functions — if they are indeed SBUs, and not merely a new name for the old division with limited responsibilities.

When a review of the new requirements of business is done, three types of strategic solution often emerge in terms of how responsibility for computing hardware and applications may be allocated to

Figure 5.2 Communications in SBU and functional structures



individual business units placed at different points along a continuum of solutions (Figure 5.3).

— Shared applications on shared computers.

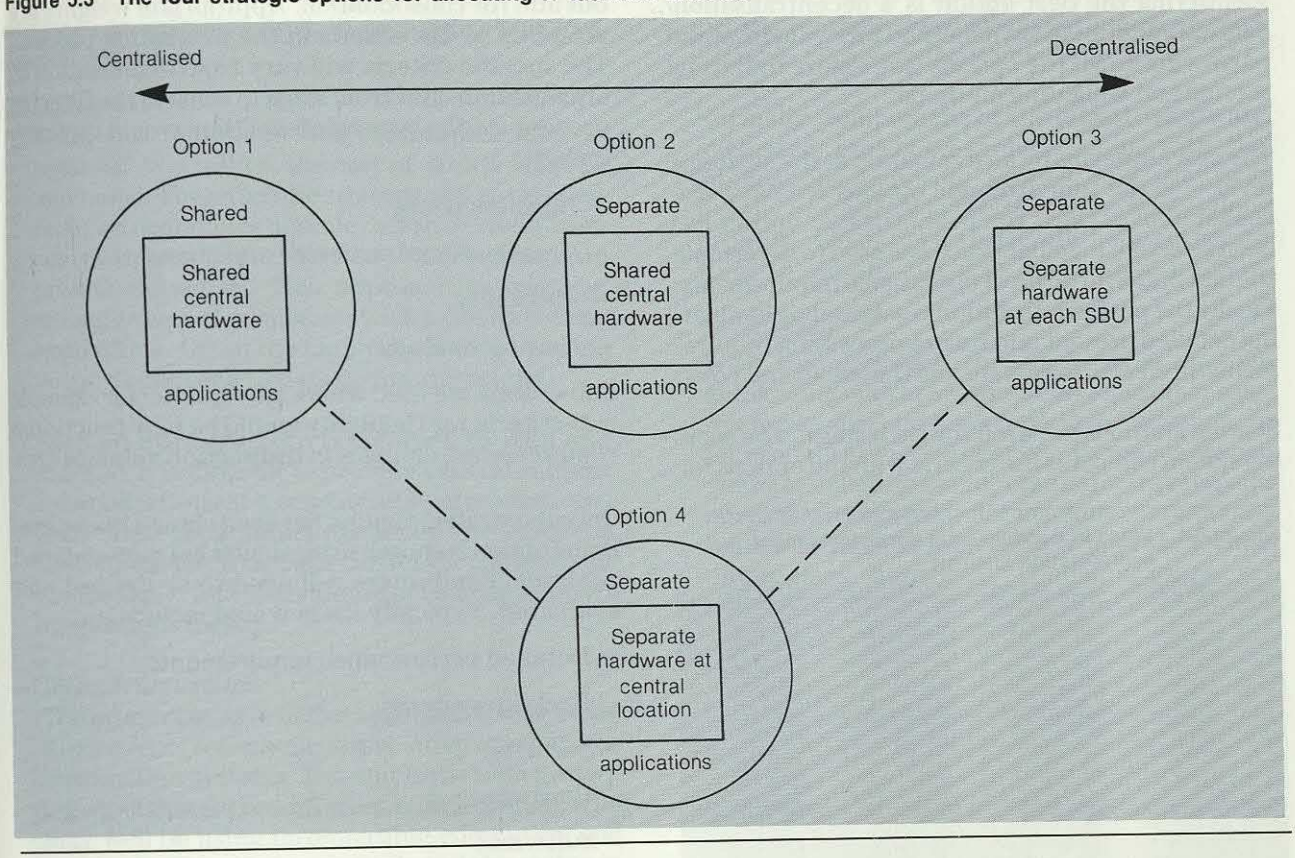
— Dedicated applications on shared computers.

— Dedicated applications on dedicated computers.

The first case, where the business continues to use central computing facilities, will often be selected where the unit is located in the same town or area as the facilities, and where the nature of the unit's business is such that most of the key systems on the central facilities were in fact developed for them in the first place. Frequently, these business units are the core of the company, and feel that they should break away from the centre, yet economically it often makes sense for them to continue using central facilities.

The second case of selectively using the central facility while developing and using its own applications (or at least some), applies where the business unit is

Figure 5.3 The four strategic options for allocating IT facilities to SBUs



located in the same place as the central facility and shares common requirements with other business units who are continuing to use the central facility. It is a case of economy of scale.

The third case of setting up a self-contained facility will often be selected not only where the business unit is a separate self-contained business, but also is in a line of business quite different from the rest of the company.

There is a fourth strategic solution which in fact combines the two extremes of the continuum in Figure 5.3. It involves locating hardware centrally, but allocating separate IT facilities (including a separate machine) to individual business units. These logically separate but centrally located facilities enable each business unit to have control over its own IT resources, while at the same time allowing technical management, maintenance and similar kinds of support to be shared by several units.

The four options are strategic categories which in real life will be subject to variations. For example, a combination of solutions or variants may be appropriate in an organistion where the needs of different business units vary significantly.

The solution appropriate to any particular organisation will depend on:

- The overall organisational structure and the style of management. In some organisations overall policies will be imposed that govern such situations, for example, by headquarters or government departments.
- The extent to which any such policies are resisted by major business units or central IS services, ie the relative priorities placed on different solutions by the interested parties, and their political muscle within the organisation.
- Constraints imposed by geography or existing systems.
- The degree of flexibility required to cope with both present and changing future requirements. These include organisational changes and new business needs, and the technical requirements and parameters (eg capacity requirements and new technologies) that may be associated with these. It must be remembered that although business needs, technical requirements and policies may dictate the need for flexibility, flexibility usually costs money. The solution chosen must therefore reflect the benefits likely to be obtained.

The ideal solution will vary from organisation to organisation and from time to time as business needs change. Each company has its unique features, and the matching of IT facilities to the business structure

has to be worked out individually. One method for identifying the best option is a decentralisation/centralisation analysis, a method for evaluating and narrowing down the options (see Figure 5.4) using scoring and weighting methods.

The process begins by an evaluation at the strategic level — ie the four strategic options we have discussed above. Once the best strategic option has been selected, a similar process is used to determine the best option in terms of operational requirements. Finally the preferred solution is selected by evaluating detailed present and future processing requirements, preferred hardware and the associated costs.

Scoring methods are used for each stage. The scoring system compares the criteria with the options for each business unit, using techniques for averaging out and for consolidation. Appropriate weights are attached to the criteria in the evaluation process. The specific criteria will vary from organisation to organisation, and from stage to stage in the filtering process. At the strategic level they would typically include:

— Business needs.

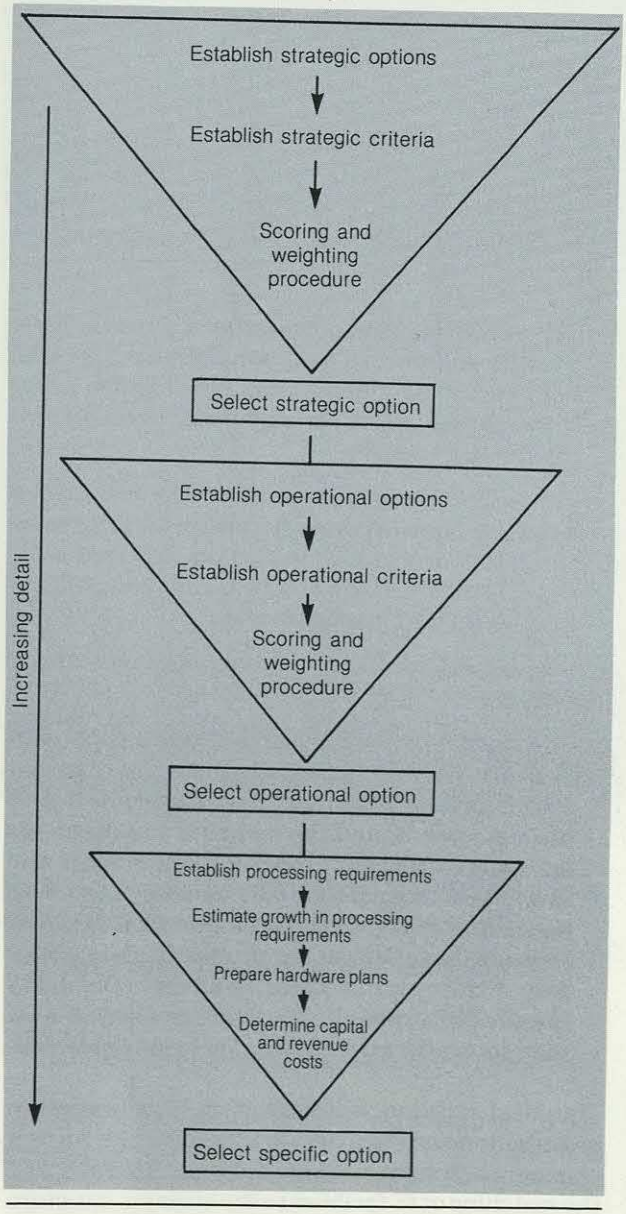
— Organisational structure and changes.

— Flexibility.

— New technology.

Sub-criteria are used where appropriate (for example sub-criteria for flexibility would be new functional requirements, changes in transaction volumes etc).

Figure 5.4 Steps in conducting a decentralisation/centralisation analysis



Once the strategic option has been chosen, the operational option is chosen using similar but more detailed analyses. Parameters will need to be defined and evaluated. Typically these would include:

— Detailed performance requirements.

— Back-up systems.

— Security.

— Hardware.

— Software.

— Data communications.

— Vendors.

— Costs and timescale associated with all the above.

Once the operational option has been chosen, the detailed requirements are assessed, in terms of current and likely future processing requirements, supplier and hardware plans and costs. From an evaluation of these the specific option is arrived at.

TELECOMMUNICATIONS

A telecommunications infrastructure links locations for the purpose of transmitting voice, data, text and images, ideally so that the user is not aware of distance or protocol differences. The choice of telecommunications infrastructure will depend on the purpose it is to serve and the kind of organisation that uses it. We have identified five generic strategies or approaches to its telecommunications infrastructure that an organisation may adopt: Utility-led, infrastructure-led, application-led, market-led and evolutionary. The first two are essentially options for group-wide telecommunications infrastructures. The second two are more likely to be options for single businesses or for SBUs that are part of a wider group. The last — evolutionary — may apply to either. As commercial responsibility is increasingly

devolved to business units, we predict that the path that many organisations will follow will be from a utility to an infrastructure to an application to a market approach.

– *Utility-led*
With this approach telecommunications is regarded as a utility, the cost of which must be minimised. Therefore the strategy will be one that relies on economies of scale, often derived from concentrating traffic between major sites onto private networks. This approach is common among groups of companies with a strong central head office. Often the emphasis is on providing voice, as opposed to data communications.

Such an infrastructure is complex to plan and manage. It is difficult to provide central support for applications at a considerable organisational (and often geographic) distance. The centre is therefore likely to act as a carrier for the group of companies while individual companies support applications locally.

– *Infrastructure-led*
The prime objective of this approach is to provide a coherent communications environment for information systems. The emphasis is on providing a tool that serves different business units, who may well be using incompatible computers and terminals. Therefore standards and the ability to interconnect systems are important. This approach is common among groups of companies with relative autonomy from head office, but where head office takes a lead in coordinating communications. The emphasis is typically on providing data communications.

The decision to adopt this approach must necessarily be corporate, because it will normally involve a substantial investment and a substantial commitment, at least to particular suppliers and often to a long-term strategy. Nonetheless, the decision to take this path will usually remain independent of decisions on individual applications. It will reflect the direction(s) the organisation wants to take for the future, influenced but not dominated by the requirement to carry internal divisions and operating companies along with it.

Network management for the transmission and switching network will need to be centralised, but operational responsibility and support for non-voice applications will often devolve to end-user support staff.

– *Application-led*
With this approach the telecommunications infrastructure is defined by business application requirements. The key criterion will be how effectively these applications are supported. It is therefore more focused than the 'infrastructure' approach. Networks used by international airlines for their reservations systems are a good example of the application-led approach.

Normally, components of the infrastructure are evaluated project-by-project, along with the applications requiring service, and they will usually be justified in terms of those applications projects. Sometimes there will be a corporate fund to get the network established initially.

– *Market-led*
With this approach the emphasis is on communicating with an organisation's customer base. Networks are used for competitive advantage, or for product or service delivery. Examples are networks installed by tour operators for travel agents or ATM (automated teller machine) networks by banks. Unlike the 'application' approach which emphasises 'horizontal' communications, the emphasis is on vertical communications with the marketplace.

The degree of business risk associated with network developments in this category means that management will often be reluctant to take further risks with unproven technology or with new suppliers. For the same reason (business risk), standards are a crucial issue and in certain industries industry-specific standards are assuming growing importance.

– *Evolutionary*
This approach is common among organisations who have no dominant application or business need and who opt, deliberately or by default, to respond to events as they unfold. The main criteria is adaptability and flexibility rather than cost, connectivity, application support or market need. This approach is common among some public administrations.

These different approaches and the relative importance of different factors that influence which option is adopted are summarised in Figure 5.5 on the next page.

CORPORATE DATA

The term 'database' has been around for at least 15 years. Some organisations are still struggling to implement computerised databases, but such databases do have an important strategic role in many companies. For instance, British Telecom (BT), the United Kingdom's main public telecommunications operator, is spending several hundred million dollars to develop a new database to support customer services. It intends to implement a front-office service concept, whereby a single telephone call enables a

Figure 5.5 Approaches to telecommunications infrastructure

Approach	Decision factors						
	Industry sector	*Typical decision point*	*Cost/ performance*	*Standards*	*Application support*	*Risk*	*Impact on business*
Utility-led	(Groups of businesses)	Group communications function	● ● ● ●	●	●	●	●
Infrastructure-led	Petro-chemicals and light engineering	Corporate management services function	● ●	● ● ● ●	● ● ●	● ●	● ●
Applications-led	Other large-scale production manufacturing, mining and construction	Communications manager, within management services function	● ● ●	● ●	● ● ● ●	● ●	● ●
Market-led	Retail financial services; retail distributive services	Main board	●	● ●	●	● ● ● ●	● ● ● ●
Evolutionary	Specialised manufacturing; business services; public services	Systems committee; departmental or divisional line managers; communications manager	● ● ●	●	● ● ●	●	●

Note: The higher the number of ●, the more important the decision factor.

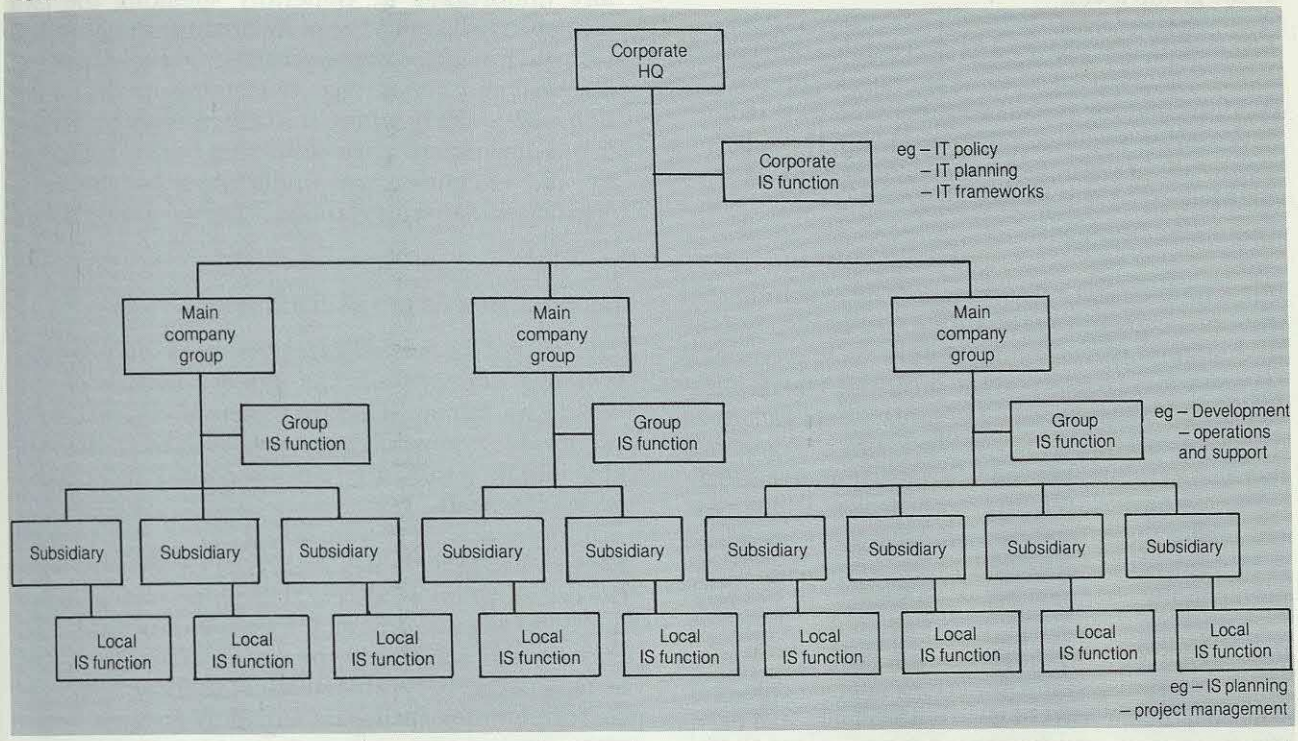
customer to obtain information on all the services he or she needs. This can be achieved only if the customer's data is accessible to front-office staff instantaneously through a terminal. It also implies that all data relevant to a customer — including international business customers — is held on a database.

Most organisations that use computer databases have developed these as adjuncts to some major function and not to support the whole organisation. Thus, many firms have successfully implemented manufacturing databases, marketing and sales databases, financial and personnel databases. Typically, they carry out a thorough data analysis and design a data architecture that suits the requirements of the organisation, albeit in functional or other compartments. We are not aware of any organisation of any size that has successfully implemented a full corporate-wide database. Nor do we see such a database as necessarily desirable. It is a question of priorities. Except in small businesses, the functions of an organisation are parcelled out in order to work effectively. Even where there is a strong need to share data between functions or parts of an organisation, there is an even stronger need to share data within a function. Moreoever, the complexity of developing a data model suitable for the entire enterprise often defeats the purpose of so doing, because by the time the analyst has completed the picture, the chances are that the organisation and its requirements have changed.

What we do see emerging is the need for a head-office database, which is not the same as a corporate database. A corporate database contains all the entities, attributes and relationships of interest to the entire company in one database. This, we have noted is an impossible task for most large organisations. However, a head-office database is one designed to serve head-office functions only. Although some of the data will be needed at the detailed transaction level, most of it will be needed at an aggregate level. For instance, the corporate treasurer or cash manager does not normally need to know the precise details of the cash flow for each retail outlet. All he needs is the gross takings of the outlets at the end of day or week.

One of the main difficulties encountered in developing head-office databases, apart from the politics of large organisations, is reconciling data from different parts of the company. This is a problem of definition and aggregation. To give a simple example from our research, a large multinational which operates worldwide had severe problems with aggregated sales data provided by its numerous operating companies. There was no standard definition of the key terms. In order to make life easy for the operating companies that have to provide the data, they were allowed to provide data along their own regional structure. For example, one company sells to both East and West European countries through one European regional office. Hence it

Figure 5.6 IS organisational units in large groups of companies



reported figures for all of Europe. At the same time, another subsidiary handles the EEC countries as one region and so reported EEC countries as a unit.

What this example shows is that the designer needs to ensure that data for head-office functions conforms to one of the basic ground rules of databases (and computer systems), which is that data must be defined consistently and collected at the right level of aggregation. In this example, standard definitions of 'Europe' and its various overlapping subsets are needed, and the correct level of aggregation is country, rather than region.

It is also worth noting that the newer relational database software is becoming increasingly efficient. Relational database software allows easy access to data without needing as much prior knowledge of the requirements and parameters that define the search as is needed for conventional database software. This advantage is paid for in the form of reduced search efficiency (ie a greater utilisation of computer processing power). In a few years, with further improvements in hardware performance, relational database software should be suitable for use in ordinary transactions-oriented applications, rather than be restricted to end-user applications.

DISTRIBUTION OF THE INFORMATION SYSTEMS FUNCTION

The arguments for and against a greater distribution of the technological infrastructure tend to centre around the relative merits and costs of alternative technologies and configurations. However, underlying these arguments is often the question of the distribution of the work associated with the technology and the people who undertake it. Some IS functions resist the change to greater distribution for fear of losing hard-won empires.

Many organisations have created separate information systems functions within user departments or operating companies. The responsibilities of these distributed functions will grow. It is also likely that these organistional units, or some parts of them, will in turn be increasingly distributed to lower levels in user organisations.

Large organisations that are made up of a variety of subsidiaries, grouped at more than one level, will typically have information systems units at a number of levels (see Figure 5.6). The main information systems units will generally, though not necessarily, be found at one level throughout the organisation. Whether they will remain at that level or be distributed further down the structure will depend on a number of factors. If the subsidiaries being served are autonomous and business-independent (ie are not functionally tied), the group function is likely to be distributed to a lower level. On the other hand if the subsidiaries' businesses are connected (ie they serve each other in some way, such as retail outlets being served by a distribution company), then the

group unit, or a good part of it, is likely to be retained at the group level.

Although the trend towards decentralisation is being felt in organisations of all types, the extent to which the information systems function is, and can be, decentralised will vary. Research into the relationship between organisational structure and degree of distribution of the IS function has revealed some interesting findings.

For example, several researchers have shown that in more successful organisations, the structure of the IS function corresponds closely to the general organisational pattern of the business. The implication is that a decentralised organisational structure calls for a decentralisation of the IS function and vice versa. There are also indications that decentralisation is most successful with organisations that are highly formalised, ie that have more standard rules and procedures and more formalised communications channels between users and IS staff.

Rockart and others report from a survey of 20 heads of information systems functions in large corporations, that major parts of line responsibility had been distributed, whether to IS functions of subsidiaries or to users. Users were generally responsible for the operation of mainframe and minicomputer hardware, for the selection and maintenance of applications software, implementation of the system development lifecycle, end-user support, budgeting and applications architectures. Line activities not distributed were those associated with developing and maintaining the IT infrastructure and the support of corporate staff.

DISTRIBUTING IS WORK WITHIN THE ORGANISATION

The trend towards distribution affects most areas of work that were traditionally the exclusive domain of central IS functions. For example Figure 5.7 illustrates a selection of activities for which responsibility is devolved to users in decentralised structures. The trend is for a growing shift towards the right in the figure.

Any categoric statement on the right way to distribute IS work is likely to be wrong. Whether and to what degree different types of IS work can be distributed will, by necessity, vary enormously from organisation to organisation and indeed, for different kinds of IT projects in the same organisation. However, there are some overall principles which we now discuss.

In considering the distribution of information systems work it is important to consider *responsibility* for the work separately from execution, ie who actually undertakes it. Generally speaking the two aspects will lie with the same organisational entity. However, it is not uncommon to find those with the responsibility effectively contracting out the execution, particularly where the skills are not available. In our discussions we assume that both responsibility and execution are undertaken by the same organisational entity unless otherwise specifically mentioned.

DISTRIBUTION OF RESEARCH WORK

The extent to which research work may be distributed depends on the subject matter of the research, human resource factors (ie the skills required to undertake the work, and the skills available and how they are to be used) and the purpose of the research.

Research to ascertain current user experience with the organisation's existing IT facilities is most likely intended to pave the way for providing improved information systems in the future. Therefore, it is usually better to locate it nearest to those responsible for planning future information systems. Some of the findings of the research would also be relevant to those responsible for delivering information systems, and therefore mechanisms need to be in place to ensure that the results are communicated to those who develop systems.

Research associated with keeping abreast of IT developments and with other organisations' experiences will normally be a central responsibility. On occasions there may be a specialist technology, which may appear to be applicable only to a particular business within the organisation and it may seem reasonable to distribute this kind of research. However, the organisation runs the risk that other applications of the technology may be overlooked. Therefore, wherever the research is physically undertaken, there needs to be effective communication with those who undertake central planning of IT facilities.

DISTRIBUTION OF PLANNING WORK

The extent to which planning work is distributed depends mainly on the overall structure of the organisation, the area of planning, human resource factors, and the level of planning.

Overall structure of the organisation

Planning information systems will depend on whether the organisation is structured functionally or by SBU. In the functional structure, planning can only be done effectively at a central level, where a view of the total organisation is available.

In the SBU structure, planning is in principle best

Figure 5.7 Centralisation and decentralisation of different types of IS activities

ACTIVITY	VERY CENTRALISED ← SPECTRUM → VERY DISTRIBUTED				
Research and planning					
Planning IT strategy	No involvement from user		User initiates strategy and/or provides input		User determines strategy
Priority setting	Priorities are imposed by central unit	User places requirements		User ranks order requirements	User sets priorities
Budgeting	User presents needs but not in monetary terms	User sets constraints to expenditures		User details budgetary requirements	User is in charge of resource budgeting and control
Review and evaluation	User is not involved in evaluation	User collects data on performance	User sets performance criteria	User participates in performance evaluation	User evaluates system performance
Setting working procedures	Working procedures are imposed by centre	User suggests working procedures		User modifies central working procedures according to local circumstances	User sets working procedures
Development					
System definition	User raises preliminary requirements	User defines requirements	User selects a solution among proposed alternatives	User participates in definition team	User performs system definition
Structured analysis	User is not involved	User reviews system documentation	User defines detailed requirements	User participates in analysis team	User performs structured analysis
Structured design	User is not involved	User reviews physical design	User defines physical requirement	User participates in design team	User performs structured analysis
Application programming	Turnkey system	User forwards programming requirements	User participates in programming team	User supervises programming	User writes programs
Database administration	User controls only source documents	User sets data requirements	User performs logical design of database	User performs physical design of database	User manages independent database
Documentation	User receives functional guidelines	User writes user manuals	User participates in technical documentation	User prepares detailed description of all manuals, programs, and database	
Operation and support					
Hardware operation	User does not operate hardware equipment	User operates terminals and/or data entry	User operates local front-end computer	User operates local computer as part of a centralised system	User possesses independent computer centre
Communication network operation	User gets central services	User operates a network supported by staff personnel			User in charge of network
System programming	User applies given operating system	User accommodates application programs to a given operating system		User maintains operating system	User develops and maintains an operating system
Application software maintenance	User complains on errors in programs	User requests changes and modifications in application program			User corrects errors and makes changes in application programs
Input preparation	User prepares source documents	User keys into a central data entry system		User keys into a local data entry system	User possesses a local independent input and file system
File handling	All data files are central	User is responsible for data located in a central site		User handles local files as part of a network	User possesses independent local files
User training	User gets training from others	User sets training requirements	User prepares training material	User conducts part of the training	User is fully responsible for training
Output distribution to departmental users	Central output printing	Combination of central printing and local output facilities		Local output facilities connected to a central computer	User operates a local independent output system
Output distribution to customers	Central report printing and mailing	Central printing and user mails to customers			User prints out and mails to customers
Scheduling operational tasks	Timetable for operations is centrally scheduled	User prioritises tasks		User suggests scheduling	User schedules operational tasks

(Extended and adapted from Datamation, 'Living in a distributed world', September 1985).

delegated to each SBU, although overall co-ordination may be beneficial. The extent to which planning can be distributed will depend on the extent to which each SBU is independent of the rest of the organisation (ie the extent to which it is a 'true' SBU).

Area of planning

IT strategy planning will generally be associated with business planning, and it is therefore best to distribute it only to the same extent that the latter is distributed.

Planning of the information technology infrastructure is also likely to be a central concern, even if some or all of the subsequent development/implementation is distributed. However, where a part of the IT infrastructure is used by one area of the business alone, then it is reasonable to locate planning of that part of the infrastructure with that business area.

Human resource factors

Human resource factors (ie primarily the experience and skills required and available to undertake planning work) play an important part in determining the best arrangement for organising planning work. Ideally, those who undertake information systems planning should be those with both the greatest experience in information systems work and with the greatest understanding of the business, its priorities and its practices.

It is not always easy to find this combination of attributes in one person. Therefore, one approach is for organisations to take IS people from central IS functions and move them out into the business. (This approach is based on the arguable assumption that IS skills are harder to instill than an understanding of the business.)

Another approach is to make planning work a joint undertaking between a business manager and a skilled planner from a central IS function. This is more likely to be the case where the number of people with IS planning skills is limited, or where the area of the business does not justify the full-time presence of an IS person.

Level of planning

Strategic IT planning is of course best distributed to the extent to which business planning is distributed. It can only be effectively distributed to individual business units if these are genuinely independent operations responsible for their own business strategies and with minimal involvement from the centre. Work planning — the lowest level of planning — will be adjacent to where the actual work is carried out.

The best option for locating project planning work is less clear cut. Successful project planning depends on having both an understanding of business requirements, and skill and experience in high-level structured analysis. The technical skills are marginally more important at this level of planning than an understanding of the business. It is likely, therefore, that such planning best remains a joint undertaking between those responsible for strategic IT planning and skilled project planners most likely to be found within central IS functions.

DISTRIBUTION OF DEVELOPMENT WORK

Distribution of development work depends on the aspect of the work being considered — defining needs, developing software and building hardware systems.

Work on defining needs is more frequently distributed than other aspects. However, the need to deploy specialist skills to assist in this type of work is sometimes not recognised, it often being assumed that the local user managers have the necessary abilities.

The degree to which software development work may be distributed depends to a large extent on the availability of system development tools and the availability of skills. Some organisations have distributed this area of work to a significant extent, largely because of tools that have become available for developing applications. For example, users of Sperry's Mapper and Burroughs' Link products are usually very distributed in terms of IS. In addition, where good tools are available for handling the information extraction parts of applications, further distribution of work is possible. Usually the major concern of those trying to constrain this trend is the difficulty of predicting and controlling the extra demand placed on computing resources. However this concern is likely to diminish as the computing power/price relationship continues to improve.

The availability of the skills needed to develop applications is another factor inhibiting distribution, that is gradually being eroded. The skills required to generate information extraction routines, using advanced tools such as enquiry languages, are relatively easy to transfer to users. However, the skills required for the more complex areas of data capture and database maintenance cannot easily be transferred to users. Therefore, for the foreseeable future, a continued need will remain to develop some applications using the more traditional methods and skills that are likely to be available only in large central IS functions.

Where hardware development work (ie the work associated with acquiring and building hardware systems) is distributed, it must be carefully monitored and controlled from the centre. A clear central policy must be provided, which provides a frame-

work for distributed purchasing decisions to ensure compatibility and to benefit from economies of scale.

DISTRIBUTION OF WORK ASSOCIATED WITH THE USE OF IT FACILITIES (OPERATIONS AND SUPPORT)

Organisations need clear frameworks for deciding what, where and by whom computing resources are to be used. This will reflect the nature of the applications (eg the degree of integration with other applications and the degree of interaction between the user and the application) that will use the computing resources and the geographic distribution of offices.

Some organisations provide facilities management of distributed computing resources from the centre. They feel that this enables the management of operations staff to be left in the hands of those with the experience, and also that more appropriate career prospects can be provided for operations staff. However, where line control of these facilities is seen to be crucial to the business, distributed operations work will more likely be a user responsibility.

The extent to which support work can be distributed is less clear cut. There are already examples of organisations operating distributed user support centres (ie organisational entities set up to encourage the use of end-user computing facilities), managed from the centre or by the user. A support function for each building, but under central management, is another alternative used by some organisations. In general, the extent to which IT infrastructures and their planning and operation are a central concern, will tend to determine the distribution of support functions.

SUMMARY

The trend towards greater distribution of IT is likely to continue given current technological advances and lower prices. In practice, however, many factors affect the way in which an organisation develops its IT infrastructure. Most important perhaps is the business structure of the organisation itself. Any changes to that business structure must be reflected in the way responsibility for IT is allocated and distributed, to ensure the right level of authority over IT matters rests with those responsible for delivering business results.

Chapter 6

RELATIONSHIPS AND PEOPLE

A recurrent theme in previous chapters is the growing pervasiveness of IT throughout organisations. IT is no longer the exclusive province of IS functions: top management and end users are increasingly influential in how IT is used. IT has become too important to leave to the IT practitioners.

The effective management of relationships between IT specialists and their customers is the subject of this chapter. We first discuss the IS function's organisational positioning and its relationship with senior management and end users, including the 'commercial' aspects of the relationship based on adopting a marketing and service role for the function. We then assess the current role of the head of information systems and how his or her role is changing — and must change — to manage the systems function effectively.

ORGANISATIONAL POSITIONING OF IS FUNCTIONS

Ten years ago most DP managers complained, with justification, that their influence was limited by too low a reporting level. Over the last decade or so, the position of the information systems function has moved steadily up the hierachy in organisational charts. Increasingly we are seeing IS departments reporting to board level, often directly to the chief executive or managing director. We have first-hand evidence of this upward mobility.

In a recent survey conducted by Butler Cox we asked to whom the head of information systems reports. The results shown in Figure 6.1 indicate that although in 30 per cent of organisations he reports to finance, in 25 per cent of organisations he now reports to the chief executive. However, nearly a quarter still report to a level below board.

This is roughly in line with other studies that have investigated where in the organisation IS is positioned. For example, a study by Benjamin, Rockart and Dickensen, which tracked changes in reporting relationships from 1968 to 1985 showed that the percentage of IS functions reporting directly to the chief executive rose from 12 per cent in the 1968 survey to 20 per cent in the 1985 survey.

We regard this trend as both long term and strategic. We predict that many more organisations will see the need to have their IS functions represented directly on senior executive bodies. This is partly a reflection of growing IS budgets, but also occurs as organisations recognise the increasing contribution that information systems and technology make to the planning and execution of their businesses, and as they start to exploit these facilities for competitive purposes.

In practice, the level at which IS functions report depends on four key factors:

— *Nature of the business and contribution of IT to the business.* The contribution that IT makes to an organisation's business depends largely on the nature of its business. The greater the information content of the products of the business, the greater the contribution of IT is likely to be. For example in banks and insurance companies, IT has long been recognised as a key determinant of success. This raises the level of concern in the executive team about IS matters, and encourages the placing of the head of the IS function at a higher level within the management structure.

— *Span of control and competence of IS head.* Choosing where to place an IS function is also governed by what additional responsibilities a senior executive can take direct control of. The greater the competence of the head of the IS function, the lower the management burden on the executive to whom the head of the function reports.

Figure 6.1 Reporting relationships of IS departmental heads

IS heads reporting to:	*Percentage*
Financial director	30
Chief executive/MD	25
Other board member	25
Special committee	8
Other (below board level)	23

Note: Some IS heads reported to more than one of the above.

– *Level of appreciation and understanding of IS.* The lower the level of appreciation and understanding of senior management about IS matters, the greater the need to raise the level at which the head of the IS function is placed in the management structure. Conversely, the lower the level of this appreciation and understanding, the less likely the executive team is to consider raising the level at which the head of the IS function is placed.

– *Political considerations.* It used to be common to place the IS function under the aegis of its largest functional customer, eg production in an engineering enterprise. This is less common today. Most organisational functions make some use of IT. Associating the IS function with any one business function may be seen to provide that function with an advantage over others. If the IS function cannot report directly to the chief executive, then choosing the most neutral position is desirable. Besides reporting to heads of finance, there are examples of IS functions reporting to functions with a general administrative remit, to personnel functions and to planning functions. In other instances, IS may report to more than one function, for example to finance for budgeting matters and to the chief exectutive for application strategies.

RELATIONSHIPS

The relationship between the IS function and the rest of the business is a product of both personalities and organisation. Traditionally, these factors have often produced conflict or even outright belligerence. Even the most perfect of structures and the most appropriate allocation of responsibilities can be undermined by difficulties in personal relationships. Likewise, weaknesses in organisation can be significantly compensated for by good personal relationships.

RELATIONSHIPS WITH SENIOR MANAGEMENT

Senior managers who recognise the contribution that information systems and technology are making, and can make, to their areas of responsibility will generally be concerned that priorities for the use of IT resources are set appropriately and that IT issues and problems are properly addressed. Just how to achieve this result is not always obvious.

Executive team meetings or special committees (often called steering committees) may be set up to address these matters. A steering committee is often set up when there is no existing management grouping of the appropriate level and membership, or with the time or inclination to attend to IT matters. Although organisations that use steering committees generally accept the need for them, their success can often be undermined by getting involved in inappropriate levels of detail and by the lack of suitable mechanisms, for example, for deciding priorities. Executives (including IS executives) can regard steering committees as mere window dressing, while the real work is done elsewhere.

Senior management steering is generally concerned with three aspects of IS, in increasing levels of detail:

– IS policy setting.

– IS planning, priority setting and progressing.

– Projects.

Sometimes, successful steering is more likely to be achieved when these three levels of detail are attended to by separate levels of committee. The extent to which this is cost-and time-justifiable will depend on the size of the organisation, its structure and its IT budget. More than one steering committee addressing these matters may be needed in a large organisation, if there is more than one level of grouping of subsidiaries.

IS policy setting

The setting of policy is usually a joint undertaking between the head of the IS function and his or her superiors and peers, with the former usually proposing policies to the steering committee.

IS planning, priority setting and progressing

In the area of planning, priority setting, and progressing, a steering committee will principally be concerned with:

– Agreeing the priorities that should be attached to IT developments. This area should not be driven by the manager responsible for the IS function, although he or she will need to have their say, particularly on IT infrastructure matters.

– Receiving and approving short- and long-term plans for information systems developments and IT infrastructure implementation.

– Monitoring overall progress against the plans.

These areas for attention normally extend to financial and budgetary as well as systems matters.

Project steering committees

A steering committee set up for a specific project would only exist for the duration of the project. Project steering committees must not be a substitute for the proper allocation of project management responsibility to an individual manager, nor the place where detailed considerations about a new information system are decided upon. The latter is the province of the project team and any working groups that may be established. Nevertheless, it is

quite a good test of the commitment of managers whose staff will use the system, to see if they can be bothered to be involved in its generation.

Success factors

Steering committees are not always a success. Sometimes they are counter-productive. What makes them successful has been investigated, among others, by Drury. Among the factors that he analysed, the ones that were clearly related to success concerned the relative level of the chairman, the extent of user representation, the regularity of meetings, the source of the agenda, and the management style of the chairman (See Figure 6.2) Committees that met regularly, whose agendas were open with regard to the real items to be discussed, and that reached decisions by agreement (rather than by being imposed by top management or the committee domain) were generally found to be more successful. He also found that the level of chairman was more critical than generally accepted in determining success, and that different combinations of steering committee options led to different advantages.

RELATIONSHIPS WITH USERS

Although increasing stress is being given by IS functions to treating their users like customers, the concept has still a long way to go.

Some IS managers feel that demand would be overstimulated if they engaged in marketing activities. They run the risk of being regarded as the grudging dispenser of systems. Moreover, the trend towards distributing the IS function to users, discussed in the previous chapter, has no doubt been encouraged by the marketing failures of IS functions. IS functions will have to change their role increasingly to one of facilitating users' efforts rather than controlling them. We believe that the most appropriate relationship to be adopted between the IS function and users is based on a marketing and service approach.

To adopt a successful marketing and service approach the IS function needs to:

- Provide an end-user support service.
- Recognise that the user owns the systems and data.
- Understand users needs and satisfaction with the service.
- Take a measurable and accountable role.
- Take a market and profit-oriented role.

Providing an end-user support service

Because users are turning in ever larger numbers to end-user computing, and for ever larger amounts of computing, casual support is no longer adequate or acceptable. The structure of IS functions has evolved over the years to cater largely for conventional systems development, operations and support. The environment, until recently, has been of

Figure 6.2 Factors leading to successful steering committees

	Factor									
	Chairman		*Representation*		*Meetings*		*Agenda items*		*Decisions*	
	High level	Low level	More users	More DP	Regular	Irregular	From others	From DP	Agreed	Imposed
Advantages gained										
Top management attention to data processing	•		••		••		•			••
User involvement in systems		•	••		••		•		•	
Centralisation of authority for company DP	•		••		•		•		•	
Planning and implementation of systems	•			•	••		••		•	
Long-range planning for DP	••			•	•		•		••	
Data processing awareness of user needs	•			•	•		••		•	

Key: • Option leads to the achievement of the advantage
•• As for •, with statistically significant relationship

(Adapted from DH Drury, MIS Quarterly, June 1983)

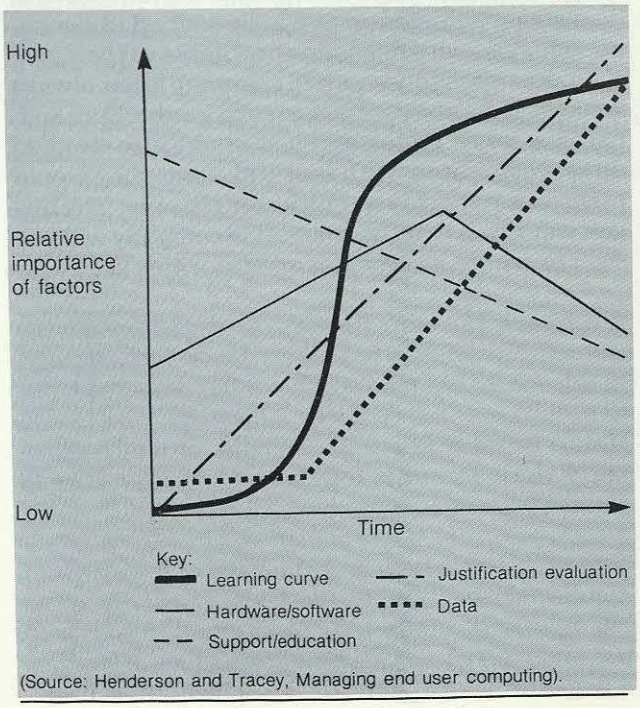
users passively receiving services. But business users are now demanding an increasingly active role, which results in tensions arising from the lack of an appropriate support structure and service. Even though many organisations have implemented some form of user support centre, these have not always been successful. Frequent reasons for this lack of success are the wrong people being assigned or tasks and goals not clearly defined.

End-users support services need to be defined at three levels:

- The relationship of that service to the rest of the organisation, including IS itself.
- The tasks to be performed by the service; for example, whether it includes actual system development or only giving advice and guidance.
- The criteria for deciding when traditional system development methods and when end-user computing should be used.

It is also important to recognise that, despite its rapid recent advances, end-user computing is still evolving, much more so than the rest of IT. For an individual firm, some factors will become less, others more critical, over time, as the users and the organisation mature in the use of the relevant tools and techniques. Figure 6.3 illustrates the changes in relative importance of key factors in end-user computing over time. Thus, whatever structures and policies are adopted they must be reviewed regularly and adjusted accordingly.

Figure 6.3 Criticality of factors over time



(Source: Henderson and Tracey, Managing end user computing).

From our experience we find that the more successful end-user service tends to be staffed by user-sympathetic and solution-oriented people, whereas the less successful tend to be staffed by technicians who are keenly interested in the technical niceties of one piece of software against another, or in the intricate advantages of a Unix-based 32-bit microcomputer versus an MS-DOS based 16-bit model. Obviously, the user-oriented support person needs to be technically competent enough to advise on the right technical solution or software package. He or she should also be interested in actively communicating with the user, helping to identify the real problem and developing the solution. In simple terms, the right sort of person is that found among the front-office user support, rather than the technical, software 'bug-solver' employed by computer service companies. In fact, the original concept of the user support centre was that it should not be part of the DP department.

Recognising that the user owns the systems and data

One of the hardest things for IS functions to recognise is that the systems and data belong to the user. Just because the systems were developed by its staff and the data happens to reside on a computer in its care, this does not mean that ownership has passed to the IS department. The IS unit acts as custodian of the systems and data on behalf of the user. As a result , the IS function develops illusions of ownership. Arguably, in some instances it is difficult to tell precisely which user unit is the owner. Often the data is owned collectively, and individual units are again only custodians at different levels of responsibility. For example, in a firm with a distributed personnel function, where the corporate personnel only defines policy and each unit looks after its own personnel function but where, for historical and economic reasons, there is a central personnel system — who then owns the personnel system and database? The answer is not the IS department!

Understanding user needs and satisfaction

If the IS function is to adopt a marketing approach, then one of the key ingredients to success is to find out what its 'market' (the users) needs and wants, and if the supplier — in this situation the IS department — already provides a service, then it must find out whether the customers are satisfied or not. This may be done by means of ad hoc surveys or formal tools, as described earlier on page 35.

Taking a measurable and accountable role

The IS function is often still treated as an overhead and as a line item in organisational budgets. Worse, some organisations do not even split IT expenditure from an overall head-office or central-services line item. With the increasing interest of organisations, including those in public administration, in

establishing value for money from IT, it is imperative to make IT spending more explicit, and to charge users for the service they receive.

However, it is important to recognise that in today's IT environment many costs associated with IT will be hidden. This is because an increasing proportion of IT costs is moving away from IS and is incurred in user departments. The days when the cost of IS was synonymous with the cost of IT to the organisation are over.

Figure 6.4 shows how the cost of IT is allocated to end users, based on a recent study conducted by us. The most popular single solution is clearly to treat IS as a cost centre that charges users on the basis of actual usage, but one in five of the organisations surveyed still treat IS as a shared overhead. A combination of different methods for allocating costs to users is also common.

Where possible, the stucture and level of charges to the user should be related to the value or benefit obtained by the user. This principle is often extremely difficult to implement. Not only are some benefits hard to quantify, but also when major hardware is installed or upgraded, the overall costs increase, initially disproportionately to the value obtained.

A way around these obstacles is to price the IS service on an agreed per-transaction basis, and when a major upgrade occurs, a central fund is used to cover the excess cost. Then, as new applications and workload come onstream, for which the upgrade was acquired in the first place, the price increase repays the central fund. This fund is essentially a 'sinking-fund well' used for capital projects, which precisely describes computer hardware acquisition.

Another problem is that of covering the system development cost. Here, the problem is that the investment needs to be made several months, sometimes longer, before the benefits begin to accrue. Once again, a central float fund to cover the cost and spread it over the anticipated life of the system may be used.

Figure 6.4 How the cost of IT is allocated to users

Ways of allocating IT costs to users	*Percentage of organisations*
A shared overhead	19
A cost centre where costs are allocated on a predetermined basis	12
A cost centre where costs are allocated on the basis of actual usage	43
A profit centre	6
A mixture of the above	20

As more user departments start to explore the availability of application software packages and stand-alone prepackaged solutions, the cost of the internal IS service will be scrutinised more carefully than ever before. In that context, the implementation of a commercial charging system for the inhouse service makes the user aware of the real cost of the service, and the IS department aware of the competitiveness or otherwise of its service.

Taking a market and profit-oriented role

Should the IS function regard itself as in a commercial, sales relationship with its internal customers? This question has been hotly debated for many years. It can lead to a totally artificial swapping of paper money, trying to build an economy by people taking in each others' work. On the other hand, IS is a scarce resource. Selling its services to the highest bidder is a very rational way of setting priorities.

Given that a growing proportion of internal users acquire and develop solutions of their own, IS functions also need to assess whether they should sell some of their services to external users. There may be advantages of doing so, apart from protecting against reduction in internal revenue. Selling to the outside world sharpens the skills needed to succeed. The external users are not as captive as many internal users often are, and the wider marketing skills acquired would also be useful in improving the internal service. However, the disadvantage is that if the external revenue is small it is a minor distraction of little strategic significance, or on the other hand, if it becomes a major proportion of the revenue the priorities of the unit could become confused.

Our research shows that an increasing number of IS departments are set up as wholly-owned IS companies charged with becoming profitable in their own right. But an autonomous IS company is not always suitable. It may be contrary to corporate culture and, perhaps more importantly, it could also provide direct competitors with useful systems they would otherwise not enjoy as quickly or cheaply. The biggest concern is that the spun-off IS company will lose sight of where its loyalties and priorities lie.

A converse but rare situation arises where a large company decides to use external services entirely. In Europe, this is what Unilever has done recently. EDS, a computer services subsidiary of General Motors (total revenue $3.5 billion, of which third-party work accounts for about $1 billion), is its IS service provider.

This situation is extremely unusual and we are not convinced that this is the start of a new trend amongst large businesses. Most organisations who use an external service tend to be small. However, a larger firm might hand over to a facilities manage-

ment firm an ageing installation that is being replaced by a different model, often from a different vendor. New applications will be developed on the new installation, while the old and stable applications slowly diminish in use and importance on the old installation. Another area where larger firms use facilities management is when mergers or acquisitions take place and the new expanded organisation inherits incompatible hardware and software from several different vendors. Often, one of the contenders is chosen as the vehicle for the new organisation, and the rest are subcontracted to the external agent.

PROFILE OF THE HEAD OF INFORMATION SYSTEMS

The professional background, but also the psychological makeup, of the IS head are crucial for a successful exploitation of IT in any organisation. Unfortunately, for many of the new areas of application we have discussed in this report, the right kind of person is unlikely to be found in the average systems department.

The problem is that most IS managers' primary objectives tend to be related to measures of efficiency rather than effectiveness (eg meeting deadlines, minimising costs, minimising turnarounds). For example, Taggart and Silbey conducted a detailed analysis of the work of an IS manager. They analysed in detail, over six months, the incidents in the daily routine of one manager. Figure 6.5 provides a summary of the incidents and their distribution according to topic. They observed that each incident had the possibility of both user and system orientation and that an effective manager recognises both needs in each incident. Rather than either a user orientation or a systems orientation exclusively, they concluded that there is a differing degree of emphasis required for each incident. The manager needs to be able to make the right decision, as to the balance between user and system orientations, on each incident. However, activities oriented to systems emphasise efficiency, whereas activities oriented to users emphasise effectiveness and political skills.

Figure 6.5 Analysis of incidents handled by IS manager

Category of incident	*Emphasis of incident*	*Number of incidents*
Hardware	Efficiency	75
Software		80
Facilities		8
Budget		25
Personnel		237
Procedures		63
Organisation		33
Policies	Effectiveness	24

Adapted from: Taggart and Silbey)

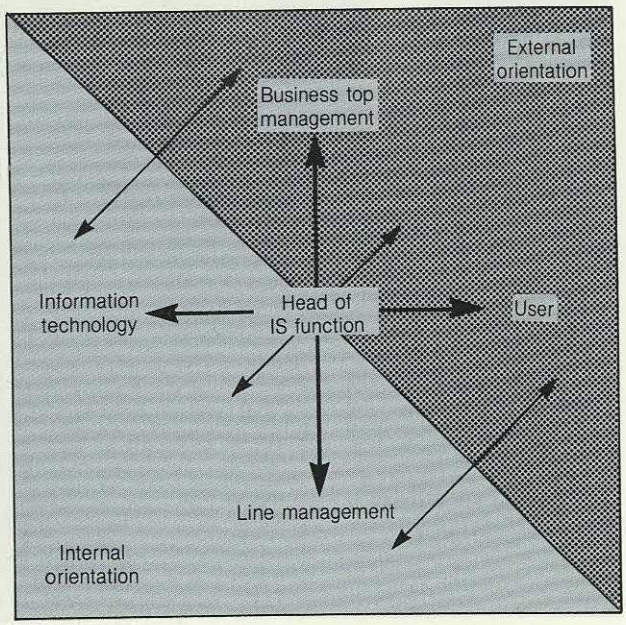
Our own observations about the orientation of many heads of IS functions are illustrated in Figure 6.6. They are, in effect, primarily downward-looking — ie oriented to the day-to-day management of their functions — or inward-looking towards the technology. Increasingly the need is for someone who is outward-looking towards the marketplace and upward-looking — ie providing appropriate advice to those who run the business.

As a consequence, the IS head will need to be first and foremost a business-oriented general manager with the following attributes and skills:

- Have considerable political, organisational and communication skills.
- Understand and have experience in the overall management of the organisation and the business in which it operates.
- Be able to understand and manage technological experts.
- Be a manager of managers not of things.
- Be heavily concerned with the medium and long term — ie a planner.
- Be sensitive to the political, organisational and human impact of new technology.

The IS head also needs to be pro-active in transferring accountability for line management of hard-

Figure 6.6 Orientations of head of IS function



ware, and where applicable, software, to user divisions and departments. Ultimately the IS head would have a role similar to that of the chief financial officer — ie he would know, and use, the interface between information systems and the business. However, he would still maintain direct line responsibility for areas such as the telecommunications networks, corporate data management, and in most cases the corporate computing facility and development of common applications.

How organisations respond to the need for their IS heads to fulfill this more demanding dual role will vary. In some organisations, the role is likely to be split into two — the upward and outward orientations essentially being the responsibility of the head and the downward line management and inward orientations being the responsibility of a deputy (see Figure 6.7). In IS functions that have very competent second-level IS managers who work well together (eg able to handle the problems of deadlines, cost overruns, new system releases, etc), the deputy position is less necessary.

The key skill of the IS head is one of achieving appropriate balance, ie effectiveness against efficiency; user service against technological advancement; user control against central IS control; open/adaptive/organic management of, for example, research work, against closed/stable/mechanistic management, for example, of operations work; and he also needs to have an attitude that accommodates and is positively disposed to change, including change that may affect his own responsibilities. It may be doubted whether the normal career progression of a DP specialist (programmer — analyst — project leader — DP manager — IS director) has much chance of generating such individuals. In a surprisingly large number of cases, good IS managers are from non-IS backgrounds, or from backgrounds that include both business and IS management.

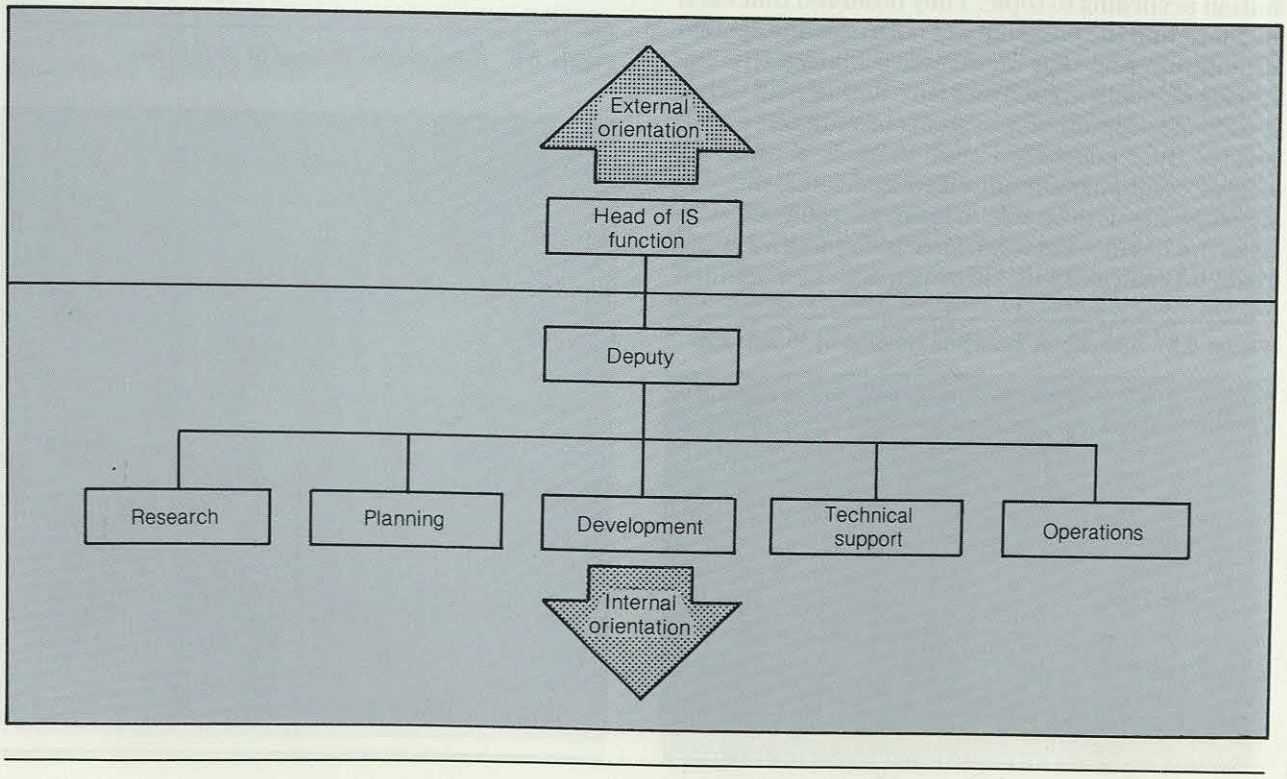
LEARNING TO RESPOND TO CHANGE

Anyone associated with information systems and technology is associated with an environment that is all about change. Not only is change associated with IS work. The IS function itself is having to cope with change, such as the increasing role of users and the distribution of IT.

It is often the case within many IS functions that learning does not take place in an organised way. Methodologies and practices may effectively strangle learning through their rigidity and formality. Too often the IS environment inhibits an open positive attitude to mistakes and a willingness to learn from them.

IS functions sometimes find it different to learn to respond and adapt to change. For example, it is often said that those development people who are used to third-generation languages (eg Cobol) and traditional

Figure 6.7 Use of deputy in IS function



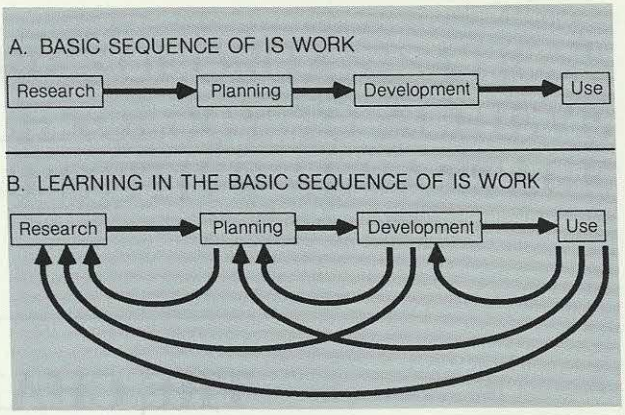
ways of developing systems, find it difficult to accept the use of fourth-generation tools and less formal development approaches. Some IS functions reject the use of such tools, despite the fact that their use may be beneficial. Other IS functions have recognised their merits, and the resistance that there is to their adoption, and have used tactics that have gradually introduced them, for example by creating separate development groups and staffing them with trainees.

Whatever means are established for undertaking the work of an IS function, they must enable it to learn. The four basic types of IS work (ie research, planning, development, use) generally take place in sequence, as is illustrated in the top half of Figure 6.8. However, for IS functions to learn, the procedures that are followed must allow work on new developments to benefit from the knowledge gained on previous developments, as is illustrated in the bottom half of Figure 6.8.

Also, IS work generally proceeds through a number of stages, each stage associated with an increasing level of detail, with the emphasis shifting progressively from work of a *planning* nature to work of a *development* nature. Within each stage, work generally proceeds in a sequential fashion, although over the whole cycle of development, work is effectively proceeding in parallel. This is necessary to enable each area of work to benefit from the knowledge that is accrued in the other areas, so ensuring that the whole cycle of development benefits in a synergistic fashion.

Mechanisms need to be in place to make sure that the knowledge is being gathered and that the messages are being drawn out and discussed, and appropriate responses determined. Nolan (in 'Managing the Data Resource Function'), suggests that change is more than progressing up a learning curve of experience. He identifies a period of 'technological discontinuity' occuring in many IS functions as they make the transition from a traditional data-processing environment to a user-dominated one. The user-dominated technology has its own learning curve. The discontinuity arises from the transition that is taking place from the data-processing learning curve

Figure 6.8 Learning and the basic types of work



to the user learning curves. Managing this transition is a key issue for IS functions.

Some IS functions have adapted traditional Organisation Development (OD) to identify and pursue change processes. OD is usually a top-down educational process by which human resources are continuously identified, allocated, and expanded in ways which make these resources more available to the organisation. It generally involves a planned and systematic attempt to change patterns of organisational behaviour. Its goals are more effective organisational functioning and an improvement in the quality of working life experienced by individuals within the organisation.

SUMMARY

We have pointed to a number of changes that are already occuring and that need to occur in the way relationships are established between IS functions and the rest of the organisation, between the people providing the service and those using it. As these changes are occuring it becomes more important *who* the IS head is, rather than what his technical credentials and expertise are. What is clear is that managing the IS function is becoming a more demanding undertaking. Managing the changes that come about through using IT will stretch organisations' abilities to cope successfully with change. Talents in these areas will be crucial to success.

THE CHALLENGE

Information systems have been with us since the first business enterprises. The earliest Mycenaean tablets dating from circa 1500 BC were originally thought to contain poems or prayers. When they were deciphered, they turned out to be the stock records of the royal palace.

Increasing levels of computerisation have created a change in degree which eventually becomes a change in kind. Systems are more integrated, more all-embracing and more closely tied to the detailed operations, as well as more directly contributory to business success.

It follows that in order to get value for money, the individual enterprise must make continually better use of the instruments provided. Sustaining an existing level of performance means falling short of the opportunity. How this constantly rising performance is to be secured is a major challenge for IS directors today.

APPENDIX

SUMMARY OF CASE HISTORIES OF ORGANISATIONS USING INFORMATION TECHNOLOGY TO ACHIEVE A COMPETITIVE ADVANTAGE

Figure A.1 Summaries of case histories of organisations using IT to gain competitive advantage

Case	Country	Sector	Ways of using IT for competitive advantage					
			Product- or service-related			Market-related		
			Differentiation	Exploiting niche markets	Influencing costs	Locking trading partners in or out	Creating new business	Changing business processes
Abbey Life	UK	Insurance	✓			✓		✓
ACCORD	UK	Retail		✓		✓		✓
Aetna Life	USA	Insurance	✓			✓		
AGvO Opel	Germany	Car dealer						✓
American Hospital Supply	USA	Medical products distribution	✓			✓		✓
Akzo	Netherlands	Chemicals and paints	✓	✓		✓		
Alco Standard	USA	Paper			✓			
American Air Lines	USA	Transport	✓		✓	✓		✓
American Express	USA/worldwide	Finance services	✓					✓
ARA	USA	Magazine distribution	✓			✓		
ARCO	USA	Oil			✓		✓	
Bank of America	USA	Banking	✓	✓		✓		
Bank of Scotland	UK	Banking	✓			✓		✓
Bank One	USA	Banking	✓			✓	✓	✓
Beecham Foods	UK	Food			✓			
Benjamin Moore	USA	Paints	✓			✓		✓

Application	Summary description
Portable micros as aids for sales presentations	Half of Abbey Life's employees are direct-sales staff involved in generating new business. Over one quarter have bought Epson portable micros. These enable the staff to provide on-the-spot information, which is updated by head office, and which enhances the quality of presentations and reduces calculation errors. The company met the cost of developing the system and the employees paid for the micros.
Forging manufacturer-distributor links through an ordering system	This textile and carpet manufacturer uses the Datec network and facilities to provide its major customers with a computer-based carpet ordering system. This allows the manufacturer to monitor and control stock better, the retail outlet to perform additional administrative tasks on the computer and provide a better service; and the customer to have a confirmed delivery date.
Customer access to insurance database	Aetna Life gives large corporate customers access to its Acclaims system, which processes group insurance claims. Customers are able to analyse their own data using Aetna Life's centralised data files.
Sales support system with extensive customer information base	The general management of AGvO decided to install the sales support system on their IBM mainframe computer. Central to its operation is an external sales prospect file, maintained continuously by the sales person responsible. The system produces weekly diary reminder sheets, standard letters, and also supports sales management by producing prospect lists. The system is seen as an important application that has increased sales.
On-site order entry by customers	To gain an edge over its competitors, AHS developed an order entry system linking most of its hospital customers to AHS computers — free of charge. As well as allowing goods ordering, the system enables customers to control inventory. Today over 4,000 terminals are installed and AHS' market share has increased as a result.
Information systems for car 'body' shops	Akzo Coatings and Akzo Systems have produced a PC-based information system for sale to car body repair shops. Through Akzo-supplied terminals, the repair shop inputs data about the original colour of the car, its age, condition, and so on, and obtains a printout of the colour the car should be resprayed, in terms of Akzo paint numbers. Akzo believes it is two years ahead of its competitors.
Speeding up inventory turnover using management systems	Alco Standard made a major investment in inventory management and control systems which resulted in the company being able to turn over its inventory faster than could its competitors. According to Alco's chairman, by turning the internal cost-savings into a price advantage, the company's market share and profits have increased.
Online airline reservation system	In the late 1970s American Airlines was the first company to provide an online reservation system to travel agents. The Sabre system lists the flight schedules of every major airline in the world, charging other carriers $1.75 for each reservation made. Sabre also offers further facilities, such as hotel and car booking.
Extensive systems for operations support and expansion	This international financial service company has a massive global data processing and communications network to support its operations. For example its data network links well over 8,000 data terminals, 5,000 POS terminals and 60 third-party links. The company uses systems as key competitive weapons, eliminating time and distance through instantaneous financial transactions across the world.
Using IT to add value to distribution links	At the end of each month, ARA produces a computer-generated profitability report for each of its magazine distributors which tells them how well each magazine sold, based on the number of returned magazines. By giving this additional and useful service free, ARA has established a competitive advantage over other distributors.
Price notification system	ARCO uses public networks, eg Western Union's Easylink, to communicate oil-price changes directly to thousands of its distributors. This method cuts out several layers of middle management, enabling distributors to adjust their retail prices and make savings or win business, more quickly than their competitors.
Cash management for corporate customers	B of A offers cash management analysis tools on a personal computer for corporate treasurers. The facilities include analyses of corporate balances; a direct link to the bank's funds transfer system and, via B of A, links to other major banks.
Home banking on videotex	The Bank of Scotland originally offered home banking on Prestel as part of Homelink, the Nottingham Building Society's general home services package. It now runs its own home banking service, HOBS. This allows any Bank of Scotland customer to make transactions and manage their account via Prestel. Interestingly, the majority of the present user base of 1,000 is small businesses, the minority residential users.
Strategic development of electronic delivery systems	Since the 1960s this bank has consistently spent 3% of its earnings on R&D. It has been among the first banks to introduce ATMS, POS and home banking. It is now concentrating on replacing human tellers with electronic delivery systems and is leasing the extra desk space to real estate and insurance agents and other external financial services.
Private videotex used by sales staff in their homes	This highly centralised company uses private videotex on its IBM mainframe to support all levels of sales management and field sales staff. A mailbox facility enables field staff to send orders to head office for processing, and allows other levels of sales staff to receive urgent messages. This system is alleged to be cheaper and faster than the previous mail- and optical-character-reader methods it replaced.
Using IT to analyse and match colour	The company supplies paint retailers with a combination of personal computer and spectrophotometer to analyse fabric or paint colour samples, even small areas. Within seconds the computer prints out a paint 'formula' — the combination of Benjamin Moore pigments required to match the sample exactly. The company has sold over 200 of these machines, which cost retailers $25,000 each.

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Figure A.1 Summaries of case histories of organisations using IT to gain competitive advantage (continued)

Case	Country	Sector	Ways of using IT for competitive advantage					
			Product- or service-related			Market-related		
			Differentiation	Exploiting niche markets	Influencing costs	Locking trading partners in or out	Creating new business	Changing business processes
Boeing Aircraft	USA	Aircraft			✓	✓		
British Petroleum	UK	Oil						✓
British Home Stores	UK	Retail	✓			✓		✓
Brooke Bond Oxo	UK	Food			✓			✓
CARDIS	USA	Freight bureau service			✓			✓
Car/Puter	USA	Car broking bureau service	✓		✓			✓
Catalina Marketing	USA	Service		✓				
CCN	UK	Credit rating		✓			✓	
Cigna Corporation	USA	Insurance	✓			✓		
Comp-U-Card	USA/(UK)	Service		✓		✓	✓	✓
Courage Take Home Trade	UK	Drinks			✓			
Courtaulds	UK	Textiles	✓		✓	✓		
Delta Airlines	USA	Transport			✓			✓
Digital Equipment Corporation	USA/worldwide	Computer manufacturer			✓			✓
Distriphar	France	Pharmaceutical distributor	✓		✓	✓		✓
Eastman Kodak	USA/worldwide	Photographic	✓			✓		
Federal Express	USA	Courier	✓				✓	
First Boston Bank	USA	Finance (mortgages)	✓			✓		✓

Application	*Summary description*
Electronic transmission of CAD information	Boeing has set up a computer network through which it can communicate computer-aided designs electronically to its component suppliers. As well as speeding up development time, the system reduces error and improves quality.
Executive information system for improved decision making	Several years ago, BP implemented a system that incorporated a database of internal information (eg import/export figures), external information (eg news, relating to energy, industry figures) and with an internal/external interface (eg for telexes). Because the information is stored in a uniform way, BP executives can find easily the information they need to make fast, tactical decisions. The system cost several million dollars, and has now been made more sophisticated; some executives regard the system to be essential to their work.
Electronic data interchange for deliveries	This company places delivery instructions to its hundreds of suppliers on its mainframe computer. Suppliers can dial in after hours and retrieve the instructions, thus streamlining the delivery process.
A back-office voice-response system used by sales staff	Over 250 Brooke Bond Oxo sales staff use low-cost lightweight touch-tone telephone adaptors to dial into a Comdial minicomputer. This computer acts as an interface between the user and the mainframe computer. As information is entered from the customers' premises the system reads back data to the sales person, using a prerecorded voice. It is reported that the installation expense was recovered in three years and that the system speeded up the ordering and marketing processes significantly.
A cargo data-interchange system	CARDIS is a data interchange system using McDonnell Douglas' Tymeshare as the network. It provides cargo data interchange between the exporters, ocean carriers and freight forwarders internationally.
Detailed pricing information for car buyers	Car/Puter provides car buyers with a breakdown of dealers' prices on a number of models, including markups. As middlemen, Car/Puter provide the customer with information on which to negotiate prices, and furthermore provide the dealers with a free marketing outlet.
Retail coupon targeting system	This company produces 'The Coupon Solution', a coupon printer that is connected to point-of-sales terminals in supermarkets. Data from the terminals matches the type of coupon to be given out automatically with the buying pattern of the customer.
A national online credit checking service	CCN is used by most major UK firms involved in the personal credit business, including banks, credit card operators, building societies and mail order firms. It started many years ago as an internal service of a major mail order firm.
Corporate access to regional insurance files	Cigna Corp's Risk Information Services allows corporations to access their files in Cigna's computers. This system gives customers better information about dispersed operations than they could obtain from their own computers, often enabling them to reduce insurance bills. Over 300 major companies use the system, including Monsanto, Firestone and Shell Oil.
Teleshopping through videotex	Comp-U-Card's videotex network enables home buyers to search through electronic catalogues, and compare prices and product specifications. They can buy products at prices 25-30% below suggested retail levels.
Portable micros used by salesforce	All sales staff use Epson briefcase micros to communicate with head office; Olivetti printers enable them to print out daily plans and the necessary promotional and selling information. They can also input orders after customer visits, enter notes on competitor prices and customer requirements, and prepare daily visit reports. The system is considered successful, particularly as it reduces the salesforce's administrative workload.
The use of VAN service in ordering and distribution	Courtaulds Clothing uses ICL's Tradanet VAN service to link with high-volume customers. It allows retailers to minimise delays in ordering and receiving stock. Courtaulds expects to expand the use of Tradanet very rapidly and expects all its major customers to order via the system in the next three years.
Strategic pricing using information technology	By using a computer network to gather and analyse competitors' prices on all of its 5,000 routes, Delta Airlines has been able to tailor price changes carefully to meet market conditions.
Expert systems to configure customer specifications	Because DEC markets VAX processors each with a combination of many options, it uses internally developed expert systems called R1 and X CON for the configuration of each processor. Such a laborious task could not be done efficiently without DEC's expert system.
Videotex-based VAN service for ordering	Distriphar's VAN service, based on the public videotex network, is used by over 1,000 pharmacies to place orders. Distriphar also offers a range of general and product information on the VAN service. As a result, sales of pharmaceuticals have increased and operational costs and efforts reduced.
Personal computer-based system	The Kodak-developed Technet system monitors equipment in Kodak film-processing laboratories automatically. Based on an IBM PC, it provides a number of services to the laboratories, eg automatic re-ordering from the Kodak warehouse when inventory is low.
Facsimile-based document delivery service	Zapmail was an electronic delivery service set up in 1984 to supplement the company's air courier business. After investing $300 million in advanced (satellite) technologies, however, it recently closed the service down because of losses. Observers believe, though (as does DHL, the company's major rival), that such a service is necessary and inevitable.
An electronic mortgage network	In 1983 the bank launched Shelternet, at a cost of $10 million. Acting as an 'anonymous' broking service, it allows lenders to input their terms. Estate agents and others enter mortgage requests; the system automatically makes the match and issues credit checks on completion of the transaction.

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Figure A.1 Summaries of case histories of organisations using IT to gain competitive advantage (continued)

Case	Country	Sector	Ways of using IT for competitive advantage					
			Product- or service-related			Market-related		
			Differentiation	Exploiting niche markets	Influencing costs	Locking trading partners in or out	Creating new business	Changing business processes
General Electric	USA	Household appliance manufacturer	✓			✓		
General Foods	USA	Food	✓			✓		
General Motors	USA	Car manufacturer	✓			✓		✓
General Tire	USA	Tyre manufacturer			✓			✓
Glaxo Pharmaceuticals	UK	Pharmaceuticals			✓			
Golden Wonder	UK	Food	✓		✓			✓
Hewlett Packard	USA	Computer manufacturer	✓			✓		✓
Hill Samuel	UK	Finance	✓		✓	✓		✓
Holiday Inn	USA	Hotels		✓			✓	
ICI	UK	Chemicals			✓			✓
Inland Steel	USA	Steel			✓	✓		✓
Intermodal Transportation Services	USA	Transport	✓		✓	✓		
John Deere	USA	Agricultural equipment			✓			
Karstadt	West Germany	Department store						✓
Lederle Laboratories	USA	Pharmaceuticals						✓
Louisiana Oil & Tire	USA	Oils and tyres			✓			✓
Mannington Mills	USA	Textiles	✓			✓		
McDonnell-Douglas	USA	Aircraft	✓			✓		✓

Application	*Summary description*
Product database for better customer service	In 1980, General Electric in the US opened a free telephone enquiry service offering pre- and post-sales information to customers. The telephone operators are supported by a database covering 500,000 pieces of information about all 8,500 GE products. The system handles over 1½ million enquiries a year. (The appliance business of GE has been sold to Black and Decker.)
Bar-coded data analysis for market research	General Foods takes information collected by bar-code scanners at supermarket checkouts and transforms it by adding local market information. By becoming the grocers' market analyst, General Foods claims to give its salesmen an advantage over other distributors.
Interactive videodisc used in dealers' showrooms	This company installed interactive videodisc equipment on its dealers' premises to train dealer service engineers, to train salesmen and as a sales aid in showrooms. Over 9,600 dealers have bought or leased the equipment and are using the videodiscs supplied by General Motors.
Telemarketing as a customer service	By moving the job of customer service from field sales staff to a new telemarketing centre, General Tire freed the salesforce to spend more time selling. When the telemarketing staff also took over sales to marginally profitable accounts, they sold more in their first month than had the field staff in one year.
Integrated IT for manufacturing and administration	Virtually every area of business in this company, from manufacturing to communications, is affected by computerisation. For example an electronic mail system links over 1,100 users in 16 sites. Glaxo claims that an integrated IT culture, and a highly numerate base of computer users, makes the company more effective and thus more competitive.
Microcomputers in delivery vans	Each Golden Wonder delivery van is equipped with a portable microcomputer. The delivery man, who is also a salesman, can key in the orders required and get an immediate invoice printout. Sales data is relayed by telephone at the end of the day to head office and head office can also send price and product change data to the salesmen. As well as reducing errors, the system has increased efficiency of the sales force.
A network linking manufacturers with suppliers	HP's Materials Management department uses McDonnell Douglas' EDINet to transmit automatically data to five of its major suppliers, spread across the US. Included are forecast documents which enable HP and its suppliers to respond rapidly to changes in the market.
Videotex for information dissemination in a large company	The insurance arm of this company decided in 1983 to use private videotex as a general communications network. This links its 700 branches and 'associates', providing updated daily information to salesmen. Videotex was the chosen medium because of its low capital and operating costs.
Video teleconferencing and entertainment for hotel guests	The company's Hi-NET subsidiary have begun to install earth stations at Holiday Inn and other hotel chains. The network provides entertainment programming and teleconferencing for guests. 1,500 earth stations are planned by end-1986.
Personal computers for mobile salesforce	In order to cut down on administration and to speed up order entry, several divisions of ICI have given their salesforce computer terminals for their homes. Electronic mail also helps branch managers to make informed decisions more quickly.
Steel ordering and monitoring system	Inland Steel offers its customers a system to order steel and monitor the order's progress. This system is linked with a $20 million production scheduling and monitoring system which, claims Inland, will produce inventory savings large enough for them to compete in cost with Japanese suppliers.
Price quoting system using networked microcomputers	This national trucking company uses microcomputers to link its offices to a centre that calculates all prices. The system has allowed the company to offer discounts to national accounts, a service that was previously impossible.
Online database for component availability	This company developed an online database for its engineers. While designing a new piece of equipment, the engineer can see instantly whether a part is already manufactured by John Deere. If it is, he can increase the output of this part; if it is not, the engineer might incorporate the next-best part in their designs.
IT as a multi-level retail tool	This chain of department stores uses information technology to support much of its operations. Point-of-sale terminals offer price look-up; instore terminals control POS terminals and capture sales and stock data; a central computing facility linking stores supplies management information. Standalone systems also support different retail areas.
Voice messaging for field staff	Voice messaging is used extensively in this company, both by the field sales support staff and by clinical field agents assessing clinical studies in hospitals. One drawback of the system is the lack of international links. The company is also exploring the possibility of linking messaging to a digital PABX.
Teleselling as a means of increasing sales volumes	After taking all of its salespeople off the road and making them into telephone salesmen, sales expenses have fallen and sales volume has doubled.
The use of colour graphics as an information and sales tool	This company supplies retailers with terminals incorporating colour graphics, which are used to illustrate coordinated furniture, furnishings and decor in retail shops. Using the terminal, a customer can match the colour and design of their existing furnishings with Mannington-supplied products. The terminal thus acts as both an information and a sales tool.
Computer-aided design with links to suppliers	McDonnell-Douglas uses a network system using CAD techniques, linked with ordering (which involves links with suppliers), invoicing and production control.

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Figure A.1 Summaries of case histories of organisations using IT to gain competitive advantage (continued)

Case	Country	Sector	Ways of using IT for competitive advantage					
			Product- or service-related			Market-related		
			Differentiation	Exploiting niche markets	Influencing costs	Locking trading partners in or out	Creating new business	Changing business processes
McKesson	USA	Pharmaceuticals	✓			✓		✓
MEMA	USA	Motor equipment			✓	✓		✓
Merril Lynch	USA/worldwide	Finance	✓	✓		✓	✓	✓
Milliken	USA	Design company	✓	✓		✓		
Mobil France	France	Oil						✓
Morgan Stanley	USA	Finance						✓
Mothercare	UK	Retailing	✓					✓
Motornet/Odette	UK/Europe	Automotive network service			✓			✓
Neckermann Versand	Germany	Mail order	✓			✓		✓
Nexis	USA/worldwide	Information service		✓			✓	
Norton	USA	Manufacturing	✓			✓		✓
Owen Corning	USA	Glass	✓	✓		✓		
J C Penney	USA	Department store		✓			✓	
Pitney-Bowes	USA	Office equipment	✓		✓	✓		✓
Porsche	Germany/USA	Car manufacturing	✓			✓		✓
Publix	USA	Supermarkets	✓			✓	✓	✓
Quelle	Germany	Mail order	✓			✓		✓

Application	Summary description
Electronic goods-ordering	McKesson was one of several wholesale distributors who, in the 1970s, gave retailers handheld electronic devices for ordering. It later added further facilities, such as detailed reporting facilities, customer records handling and insurance form processing. McKesson has achieved a compound growth of 16% in sales over the past five years.
Data network for the automative trade	The Motor Equipment Manufacturers Association developed Transnet on Geisco's private telecommunications network. It is one of the largest clearing houses, linking 2,000 wholesalers and retailers with 70 car manufacturers. Transnet handles over 4 million items per month; in 1984 $8 billion of orders were processed.
Online cash management package	In 1977 Merril Lynch introduced the cash management account, a combination of credit card, checking account, money market fund and broking. This required complex communication and data processing interfaces, with links to Bank One which processes the accounts.
Computer-aided design system for carpets	Milliken uses on-site computer-aided design system linked with a dyeing machine to test out new carpet designs. Milliken wins orders (and gets ideas) from interior designers by inviting them to come in and test the system themselves for free.
A voice-messaging system for sales and marketing	By mid-1984, well over 250 of Mobil France's sales force and supporting marketing team were using a US-produced voice message store-and-forward facility. Based on an IBM computer and telephone exchange, the system enables staff to leave verbal messages for each other. Some features of the system had to be changed, however, to comply with French PTT regulations.
Recruiting highly qualified graduates and using advanced system building tools to develop tailored systems	Morgan Stanley has established a policy of recruiting top quality graduates into all levels of the systems function. By training them in the use of advanced systems building tools, and promoting them rapidly, the firm has built up quality systems fast, which it claims has given it a competitive business advantage.
Videodisc as a sales aid	Interactive videodisc is installed in over 80 retail branches of Mothercare. Potential customers press buttons on the numeric keypad to view a short video of a range of products being used and highlighting safety features. During trials, sales increased by more than 20 per cent.
A pan-European data network linking manufacturers and suppliers	Motornet was launched by Geisco in 1985 in response to car manufacturers' needs to communicate with suppliers. The objective of Motornet is to save eventually per car produced once the system is installed throughout the industry; time savings in reduced paperwork between component suppliers and manufacturers are also a major benefit. The Motornet data network is capable of posting schedule releases, invoices and so on to all suppliers and manufacturers across Europe.
On-line ordering systems for a mail-order company	This company introduced touch-tone telephones with voice response and a videotex ordering system to streamline its mail order operations. Both are used by agents and videotex is also used by the public. IT has speeded up the ordering cycle and enables agents to choose alternatives when a product is unavailable.
Electronic database	Nexis subscribers are able to search quickly the full text of any article in 225 periodicals, thus reducing the time of library research and the cost of consultancy and subscription to many periodicals. Nexis, meanwhile, charges subscriptions for filling the gap.
Online ordering and pricing system for distributors	The Norton Connection information network allows distributors to enter orders electronically and also to get immediate details on the status of orders, pricing and stock. Norton plans to use the system eventually for determining factory schedules automatically.
Information and sales database for the building trade	The Insulation Division of this company provides information and advice to the building trade concerning a range of insulation materials, their application and prices. Owen Corning insulation products are among several that feature on the sales and information database.
Point-of-sales system for credit authorisation	Penney's is a leader in point-of-sales systems that provide inventory and cash control, as well as providing instant credit authorisation. The last feature has enabled Penney to expand its business; it now sells its credit card authorisation and verification system to other retail businesses, such as Shell and Gulf Oil.
Information technology to speed up customer service	When a customer dials Pitney-Bowes' toll-free service number the company draws on a central database, first to see if the problem can be solved over the telephone and then to identify the nearest service engineer who has the appropriate skills. The customer benefits by having a specialist work on the problem, with a 30% reduction in response time.
Electronic mail used by a dealer network	In addition to Geisco's trade data interchange service, Porsche uses the electronic mail function to link its US dealers in a communications network.
The use of EFTPOS on an ATM infrastructure	This company operates over 335 ATMs in its shops; these have access to 1,000 banks. In 1984 the company began to install electronic funds transfer (EFT) on the back of the ATM network, and plans to have some 3,600 terminals in place by 1990. Publix has made significant operational savings on the system, particularly on cheque-handling time and cost; the system is also very popular with customers.
Videotex and voice-response ordering system	Quelle installed a voice-response-based ordering system for direct order entry by agents who run small shops in over 3,000 villages. Agents can access the system using a small touch-tone keypad. Other, larger-volume agents use the public videotex network to order products. Voice response has generally been preferred to videotex for the latter is considered too expensive.

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Figure A.1 Summaries of case histories of organisations using IT to gain competitive advantage (continued)

Case	Country	Sector	Ways of using IT for competitive advantage					
			Product- or service-related			Market-related		
			Differentiation	Exploiting niche markets	Influencing costs	Locking trading partners in or out	Creating new business	Changing business processes
Red Lion Inns	USA	Hotels			✓	✓		
Red Lobster	USA	Restaurants			✓			
Red River Construction	USA	Construction			✓			
Reuters	UK/worldwide	Information services		✓		✓	✓	✓
Schlumberger	France/USA	Oil equipment			✓	✓		✓
Sears Roebuck	USA	Department store	✓			✓	✓	
Security Pacific	USA	Banking	✓	✓		✓	✓	✓
SEEBoard	UK	Public utility	✓					✓
Shell	UK	Oil	✓			✓		✓
Singer	USA	Electrical appliance manufacturer			✓	✓		✓
Southlands Corporation	USA	Foods			✓			✓
State Farm	USA	Insurance	✓			✓		✓
Supervalu	USA	Supermarkets			✓	✓		✓
Telcot	USA	Cotton		✓				✓
Telspar	UK	Supermarkets			✓	✓		✓
Thomas Cook	UK	Travel	✓			✓		
Thomson Holidays	UK	Travel	✓			✓		✓

Application	*Summary description*
Setting discounts through a reservations network	This chain of 52 hotels uses a minicomputer at its headquarters at the centre of a reservations network; its aim is to maximise occupancy. Red Lion Inns can now offer discounts at hotels where bookings are low and sets discount rates for tour brokers and frequent travellers, thereby cultivating repeat business.
Strategic pricing for nationwide restaurant chain	Red Lobster's national communications network provides management with next-day access to sales details. This allows decentralised pricing decisions to be made at regional level — with menus being tailored according to availability of ingredients — as well as a consistent nationwide pricing strategy from head office.
Pricing system for contract bidding	This service organisation uses a microcomputer to develop construction bids. By being able to include last-minute changes (eg, incorporating an increase in labour rates) easily, Red River is able to submit more competitive bids up to a final submission.
Financial information and currencies trading on a worldwide network	Reuters started 100 years ago as a network of reporters who supplied current affairs information to newspapers. In the 1970s it set up a continuously updated financial information service, providing data on currencies, shares and commodity prices. Today, 53,000 terminals, mostly in financial institutions, participate in a global online foreign exchange dealing system; Reuters supplies the information and the terminals. It is trying to set up a similar system, via stock exchanges, for equities trading. Reuters is successfully exploiting the fact that information on money is becoming almost as valuable as money itself.
An expert system for oil exploration	Schlumberger's Dipmeter Advisor expert system attempts to interpret measurements taken from exploratory oil wells. Skilled interpreters of these readings are scarce, yet the expertise is vital to the oil company's success.
Direct mail marketing using a customer database	Sears is the largest retailer in the US, with a huge population of Sears credit card holders. By linking credit card transactions into its large customer database, it can target its direct mail marketing both very precisely and very widely.
Credit checking system for car dealers	A new subsidiary of the bank, called Security Pacific Automation Co, is putting computer terminals into car dealerships to link them with another division, Security Pacific Credit Corp. Through the system, dealers can run credit checks and close deals faster, and customers can calculate loan payments.
Products database on videotex in retail outlets	In 1984, SEEBoard installed over 100 videotex terminals and printers in its shops. Linked to a Rediffusion computer which communicates with centralised computers, the videotex system provides up-to-date (downloaded) product details, terms of agreement, tariffs and stock records, useful both to the outlets' staff and to customers.
Analysis of fuel purchases using portable data capture terminals	In order to increase sales of its aviation fuel, Shell developed a system, based on portable data capture terminals, which enables airlines to monitor their fuel purchases. The system has reportedly attracted new customers and the system allows Shell to differentiate its fuel from that of its competitors.
A merchandise ordering system	Singer supplies its national customers with terminals, through which they can order merchandise directly from their own premises, check the status of orders and check prices and availability. Singer itself benefits from a large reduction in operations costs, and customers that are 'tied in'.
Using a computer network to eliminate in-store inventory	This large chain of supermarkets has a policy of not holding inventory in stores. Instead it uses sophisticated computer-based monitoring and tracking systems to keep inventory in warehouses and the lorries which replenish the stores' stock on a daily basis.
Electronic policy system for agents	In 1980 State Farm launched a network for its agents, which allowed not only transactions but also local records management and marketing tools. Half of the company's 1,600 agents subscribed to the system, each paying $400 per month.
Electronic data interchange in the food industry	In 1980 this supermarket chain sent 100 million transaction messages for warehoused products alone. Today, it exchanges documents electronically directly with 50 of its major suppliers through McDonnell-Douglas' EDINet service, and with 600 smaller or regional suppliers through food brokers, also on EDINet. The resulting increase in response time is particularly useful in an industry dealing with perishable goods and rapidly changing customer buying patterns.
Electronic cotton trading system	A cooperative of 20,000 Texan cotton farmers established Telcot, an electronic cotton trading system. A growing number of buyers now 'blind bid' for the cotton through a computer network. Because prices are more flexible with this system the farmers get higher returns.
A value-added order-entry system linking wholesaler and retailer	James Hall, part of the Spar group, developed Telspar to provide benefits for itself and for its retailers, thus tying them in. As well as easy yet sophisticated order input, the system offers the retailer and wholesaler detailed information on stock movements. This is particularly useful for small retailers who must have tight control of stock ranges. The retailer can also access information on a range of relevant subjects, can manage payroll, access the telex network and so on. Retailers pay a small monthly rental fee for access to Telspar.
A videotex-based travel booking service	Thomas Cook developed Travinet, which is a private videotex network based on a shared Midland Bank/Thomas Cook network. This is the vehicle for a comprehensive and expanding service to travel agents.
Videotex-based travel reservation system	Thomson Holidays was one for the first companies to provide holiday reservation facilities to travel agents. The pioneering videotex system is now an industry standard. Major competitors have been forced to develop their own, similar, products in order to maintain their share of the travel booking market.

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Figure A.1 Summaries of case histories of organisations using IT to gain competitive advantage (conclusion)

Case	Country	Sector	Ways of using IT for competitive advantage					
			Product- or service-related			Market		
			Differentiation	Exploiting niche markets	Influencing costs	Locking trading partners in or out	Creating new business	Changing business processes
Ticketron	USA	Entertainment	✓	✓		✓		✓
Toyota	USA	Car manufacturer	✓			✓		✓
Tradanet (ICL)	UK	Network service for retailers			✓	✓		✓
Travicom	UK	Service for travel trade	✓				✓	✓
United Airlines	USA	Transport	✓	✓		✓		✓
USAA	USA	Automotive insurance	✓		✓			✓
USA Today	USA	Newspaper	✓		✓			✓
Verenigde Bloemionveiling Aalsmeer	Netherlands	Cooperative			✓			✓
Vestric	UK	Pharmaceutical distributor	✓		✓	✓		✓
Wall Street Journal	USA	Newspaper	✓		✓			✓
Western Trust and Savings	USA/UK	Finance	✓				✓	
Westinghouse Electric Supply Company	USA	Electrical	✓			✓		✓
Xerox	USA	Office equipment manufacturer	✓			✓		✓

Application	*Summary description*
A network supplying an entertainment booking service	Ticketron is one of several companies that operates a booking service to agents and individuals for theatre, film, concerts and other entertainment events. Its success has taken it into other fields of entertainment, such as sports events.
A dealer network of minicomputers	Toyota's extensive system supports its widespread US network of dealers. The system provides the company with up-to-date order and inventory control data and also provides the dealers with an on-site system for running their businesses. The system also links dealers more tightly to Toyota.
Electronic data interchange network linking suppliers and retailers	Tradanet is a VAN service that also incorporates electronic data interchange. Originally sponsored by the Article Numbering Association and developed by ICL, it has been taken up extensively for transactions between the food industry and retailers and is being piloted by other industry sectors. ICL is now developing an EDI for international shipping called DISH.
Online airline booking service for travel agents	Travicom is a service for travel agents in the UK. It was developed originally to provide a common interface to different airlines' reservations systems. Well established, it is being extended to provide links to hotel and car hire reservations systems.
The use of IT for above-the-line and below-the-line marketing	United Airlines was one of the first airlines to develop an online seat reservation system for use by travel agents. However, it only included UA's flights, and was soon overtaken by American Airline's more comprehensive Sabre system. More recently United has been winning customers by offering 'frequent flyers' incentives. This scheme has the added advantage of detailed individual flying destinations and frequencies, resulting in a database that is used for direct mail marketing for new or discounted routes.
Telesales and automated records	Some time ago USAA computerised its car insurance policy information and cross-referenced it to give service representatives easy access. This allows the company to conduct sales and service over the telephone, eliminating the cost of having mobile agents.
Electronic newspaper transmission	USA Today is a colour daily newspaper that is transmitted to 17 dispersed printing plants by satellite. A full-colour, 36-page edition can be created and transmitted in only eight hours.
The use of IT in flower auctions	This company runs the largest flower auction in the world. Auction lots from growers circulate the auction room in electric cars. Buyers use terminals to bid for the lots, which are then directed electronically to the successful bidder's gates for loading. By analysing data from past sales, management can predict demand and recommend to growers which flowers to grow at which times of year.
Electronic ordering from retail premises	By mid-1984 Vestric had installed nearly 3,000 terminals in pharmacies for electronic ordering. Customers key in the orders throughout the day and a Vestric mainframe 'collects' the orders twice daily, simultaneously collecting questions and automatically confirming orders. The system has achieved substantial cost savings for Vestric.
Global transmission of a newspaper	Dow Jones uses page transmission via satellite to enable it to print the Wall Street Journal at 17 plants spread across the US. Following this, the company also started Asian and European editions, also transmitted by satellite, which use the bulk of editorial material, but insert local news items.
A diverse software package for internal use and for reselling	This subsidiary of a Canadian bank started as a small bank in the UK but invested several million dollars to become one of the most technologically advanced banks in the UK. One of the projects resulted in Tamar, a software system for retail banking, first used internally and now being sold to other organisations, eg Citibank and retail chains. This system allows the user to keep track of all the customer's contacts with the institutions, eg the state of their account, and insurance and personal details. Tamar is a useful tool for marketing other financial services.
Customer terminals for order entry	To speed up the ordering process, Westinghouse has supplied its major customers with terminals linked to Westinghouse computers.
Minicomputer-based worldwide customer support system	Between 1979 and 1982 Xerox set up a field-work support system to service its very large worldwide base of customers. Thousands of support representatives have computer access to customer details, including problems likely to be encountered. The system reduces Xerox's operation costs and improves customer service. On a parallel system, Xerox also sends manufacturing data to its suppliers, speeding up delivery.

CURRENT REPORTS IN THE BUTLER COX REPORT SERIES

Assessing Videotex: The Applications, Payoff and Trends
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This report addresses the key concerns of users and suppliers who need to establish the payoff from their current and possible future investment in videotex. It provides an up-to-date assessment of recent developments and an authoritative perspective on the future. It establishes the success factors for applications using videotex and is designed to be a valuable guide for planning applications, products and markets.

The scope of the report is international and developments in European countries, North America, Australasia and the Far East are covered. It describes and analyses where and how videotex is succeeding and failing. It discusses product, application and market developments, including the results of extensive surveys of about one thousand users, suppliers and PTTs specially undertaken for this report. It analyses market sectors and classifies applications. It describes and discusses recent and anticipated technological developments in terminals, private systems, public systems and networking. It assesses future trends and presents our market forecasts covering the period 1986 to 1991. The report compares supplier and PTT strategies and analyses the market shares of the main participants. A directory of suppliers, private system operators, PTTs and videotex associations forms a useful appendix.

Information Technology: Value for Money
Price £570

Some managers believe today that information technology is a powerful weapon in the battle for success. Others still regard it as an unavoidable expenditure to be contained. Both find that information technology is far from easy to manage. Finding the right policy for information technology in the organisation is difficult; implementing that policy may be harder still.

This report is a management guide, clearly written without jargon, encapsulating our consulting and research experience. Some of the key questions addressed include:

- Does expenditure on IT correlate with success? How much do other organisations spend on IT?
- How do senior managers perceive the role of IT in their organisations? What are their views on the performance of their information systems departments?
- What are the opportunities for using IT to improve the competitive position of an organisation? *And* what are the risks?
- Business strategy and IT strategy: How can they be linked? What are the factors to be considered and the steps to be followed to ensure an IT strategy services business objectives?
- How should the role of the information systems function be defined and structured? What should its organisational relationship be with top management and end users? What kind of individual should head up the information systems department?

Information Technology and Cash
Price £550

Rising costs and payment volumes and increasing competition have encouraged organisations such as banks and retailers to look to information technology to cut the costs of handling payments, improve service levels and deliver new cash management services. Electronic payment and cash management services present opportunities to all potential players — banks, retailers of goods and services, hardware suppliers and network services providers.

This report reviews the opportunities offered by the new electronic payment and cash management services. Retailers will be put under pressure by the banks to adopt electronic funds transfer systems at the point of sale (EFTPOS), but could harness it to cut costs or even diversify into financial services themselves. Indeed, an increasing number of organisations involved in retailing are now moving into the banking services arena, thus effectively competing with established banking and credit card services. Half the retailers we surveyed for this study plan to introduce electronic fund transfer systems at the point of sale (EFTPOS) within the next five years.

Corporations can also take advantage of new cash management services and systems to optimise cash utilisation and reduce borrowing and transaction costs, and small companies and private investors can use online 'home banking' services to manage their financial affairs more efficiently. The report describes and discusses the impact of these new systems.

New Opportunities in Office Systems: A Practical Guide
Price £500

Advanced office systems have been regarded for many years as offering great potiential. In the 1970s there was a false dawn of interest in such applications, with many forecasters anticipating a 'revolution in the office'. But the office revolution proved much easier to write about than to achieve. Those actually responsible for planning and implementing systems found many obstacles confronting them. Not least of these was the difficulty of building systems that were clearly relevant to the needs of those who would use them and the development of satisfactory criteria for investment.

A decade of experience has now been acquired, sometimes painfully. Throughout Europe and North America, advanced office systems are in use. The opportunities are better understood. A body of expertise has been developed. It is now possible to identify in a *practical* way policies and procedures that lead to successful systems.

This report is a guide to the unfolding opportunities in office systems. It provides a new perspective on the issue of assessing benefits, and supplies detailed guidelines for planning and monitoring office systems. It discusses the impact of office systems on the role of MIS departments. It analyses implications for both users and suppliers and provides a guide to the state-of-the-art of office system technologies and applications.

Information Technology: Its Impact on Marketing and Selling
Price £500

By 1995, sales and marketing teams will be fighting the competitive battle with new tools. Information technology — using computers, communications and screens — will present the value and utility of products to a wider yet more carefully selected customer base. We face the most important developments in sales and marketing since the advent of TV advertising. Companies who ignore these developments, whose sales and marketing strategies remain embedded in the pre-electronic past, face dwindling market share, rising costs and eventual eclipse. The most knowledgeable companies are planning now, asking themselves this simple but profound question: how do we sell to the institutions and citizens of the information society?

This report examines both current and likely applications for information technology products and services, and identifies the key threats and new business opportunities likely to emerge in the future.

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