The Evolving Role of Information Systems and Technology in Organizations:
A Strategic Perspective

Today, most organizations in all sectors of industry, commerce and
government are fundamentally dependent on their information systems.
In the words of Rockart\textsuperscript{1} ‘information technology has become inextricably intertwined with business’. In industries such as telecommunications, media, entertainment and financial services, where the product is already or is being increasingly digitized, the existence of an organization crucially depends on the effective application of information technology (IT). With the emergence of e-commerce, the use of technology is becoming just an accepted, indeed expected, way of conducting business. Consequently, organizations are increasingly looking toward the application of technology not only to underpin existing business operations but also to create new opportunities that provide them with a source of competitive advantage.

In order to manage information systems and information technology (IS/IT) strategically, it is helpful to understand how the role of technology-based information systems has evolved in organizations. While organizations today want to develop a more ‘strategic’ approach to managing IS/IT, many have probably arrived at their current situation as a result of various short-term ‘tactical’ decisions regarding IS/IT. Many organizations would no doubt like to rethink their investments, or even begin again with a ‘clean sheet’, but unfortunately have a ‘legacy’ resulting from a less than strategic approach to IS/IT in the past. It is rarely possible to start again—many banks and insurance companies still depend on systems first developed over 30 years ago; neither is it necessarily advisable—there is no real reason to expect more success in the future than has been the case in the past, unless ability and knowledge
have increased in the meantime. Learning from experience—the successes and failures of the past—is one of the most important aspects of strategic management. Earl has noted that much learning about the capability of IT is experiential, and that organizations tend to learn to manage IS/IT by doing, not appreciating the challenges until they have faced them.2

However, no one organization is likely to have been exposed to the whole gamut of IS/IT experiences, and neither is it likely that what has been experienced can always be evaluated objectively. This chapter provides an appraisal of the general evolution of IS/IT in major organizations, against which any organization can chart its progress and from which lessons can be learned for its future management. This evolution of IS/IT in organizations is examined from a number of viewpoints, using a variety of models, some of which are further developed and used later in the book, when considering the particular approaches required in planning strategically for IS/IT investments.

A number of important forces affect the pace and effectiveness of progress in using IS/IT and in delivering business benefits. The relative weighting of each factor varies over time, and will also vary from one organization to another. These factors include:

- the capabilities of the technology;
- the economics of deploying the technology;
- the applications that are feasible;
- the skills and abilities available, either in-house or from external sources, to develop the applications;
- the skills and abilities within the organization to use the applications;
- the pressures on the particular organization or its industry to improve performance.

This list is not meant to be exhaustive and could be expressed in other terms—but it is in a deliberate sequence of increasing ‘stress’, as the complexity and criticality of the management decision-making process becomes more strategic.

Most assessments of the evolution of IS/IT in organizations tend to focus on one or two aspects of its development—organizational, applications, management of technology, planning, etc.—but, in this chapter, these various perspectives will be brought together, as much as possible.

INFORMATION SYSTEMS (IS) AND INFORMATION TECHNOLOGY (IT)

Before providing any strategic perspective, it is important that there is a clear understanding of the distinction between the terms *information*
Information Systems (IS) and Information Technology (IT) While both terms are often used interchangeably, it is important to differentiate between the two if a meaningful dialogue is to take place between business and IS staff and ultimately successful IS/IT strategies are to be developed. It should be remembered that information systems existed in organizations long before the advent of information technology and, even today, there are still many information systems present in organizations with technology nowhere in sight.

IT refers specifically to technology, essentially hardware, software and telecommunications networks. It is thus both tangible (e.g. with servers, PCs, routers and network cables) and intangible (e.g. with software of all types). IT facilitates the acquisition, processing, storing, delivery and sharing of information and other digital content. In the European Union, the term Information and Communication Technologies or ICT is generally used instead of IT to recognize the convergence of traditional information technology and telecommunications, which were once seen as distinct areas.

The UK Academy of Information Systems (UKAIS) defines information systems as *the means by which people and organizations, utilizing technology, gather, process, store, use and disseminate information*. It is thus concerned with the purposeful utilization of information technology. The domain of study of IS, as defined by the UKAIS, involves the study of theories and practices related to the social and technological phenomena, which determine the development, use and effects of information systems in organizations and society. Mingers\(^3\) notes that, although technology is the immediate enabler of IS, ‘IS actually is part of the much wider domain of human language and communication, that IS will remain in a state of continual development and change in response both to technological innovation and to its mutual interaction with human society as a whole.’\(^4\)

Some information systems are totally automated by IT. For example, Dell Computers has a system where no human intervention is required, from taking customer orders, to delivery of components to the Dell factory for assembly, to shipment to customers. With this build-to-order model, perfect information and tight linkages match supply and demand in real time. The company can receive an order for a personal computer (PC) directly from a customer via its own website (www.dell.com). Indeed, Dell has built in an element of ‘intelligence’ into its site to help the customer in making decisions regarding the configuration of components, ensuring that ‘non-optimal’ configurations or configurations not technically possible are not selected. Customers can also choose from a variety of delivery options. Once a customer order has been confirmed, purchase orders for components are automatically
generated and electronically transmitted to suppliers. This has enabled Dell to build exactly what the customer has ordered, resulting in a stock-turn of 56–60 times per year compared with 13.5 for Compaq and 9.8 for IBM’s PC business.² Dell also feeds real-time data from technical support and manufacturing lines directly through to suppliers on a minute-by-minute basis. They also have links to many of their suppliers’ manufacturing lines so that they can see their yields. This information system (or, perhaps more correctly, multiple information systems) is underpinned by a variety of different technologies—servers, storage, software, networks, etc.

Another term that is frequently used along with IS and IT is *application*. Essentially, an application refers to the use of IT to address a business activity or process. There are essentially two types of application:

- general uses of IT hardware and software to carry out particular tasks such as word processing, electronic mail or preparing presentation materials;
- uses of technology to perform specific business activities or processes such as general accounting, production scheduling or order processing.

These applications can be carried out using pre-packaged, pre-written software programs for a particular business activity or be developed to provide particular functionality. Some business-application software packages can be tailored or customized to the specific requirements of an organization. One of the key selling points of large enterprise resource planning (ERP) packages from vendors like SAP, Baan, Oracle or JD Edwards is that they can be configured, to some extent, to meet the specific way in which an organization operates.

Checkland and Holwell⁶ have pointed out that many people find difficulty in distinguishing between IS and IT, because technology seems to overwhelm their thinking about the fundamental information system that the technology is to support. Checkland⁷ also notes that information systems exist to serve, help or support people taking action in the real world. He asserts that, in order to create a system that effectively supports users, it is first necessary to conceptualize that which *is* to be supported (the IS), since the way it is described will dictate what would be necessary to serve or support it (the IT).

This gives a clue as to why organizations may fail to realize any benefits from their investments in IT—investments are often made in technology without understanding or analysing the nature of the activities the technology is to support—either strategically or operationally—in the organization. For example, over the last few years, many organizations have
built websites without sufficient thought to the rationale behind the decision other than because everyone else seems to be getting on the ‘Net’. We have heard stories recounted of senior executives returning from business trips abroad demanding that a new technology be purchased or a new application be implemented because they have seen an advertisement in an airline’s in-flight magazine. It is important to remember that IT has no inherent value—the mere purchase of IT does not confer any benefits to the organization; these benefits must be unlocked. We shall return to this point throughout the book.

**E-business and E-commerce**

There are two other concepts that we believe are important to discuss up front, particularly given the prominence both have received: *e-business* and *e-commerce*. Since the mid-1990s, both concepts have entered the everyday vocabulary of managers and, having observed activity in many organizations such as the appointment of ‘Directors of e’, ‘e-managers’ and ‘e-Czars’ and the fact that many have developed ‘e-strategies’, suggests that e-commerce and e-business are being treated as something new and different from seeking out opportunities to deploy IS/IT. This should not be the case.

Literally, e-commerce refers to the conduct of commerce or business electronically—essentially using Internet technologies. In the 1980s, electronic commerce was already a reality, in this instance referring to intercompany trading, specifically the exchange of business documents, using electronic data interchange (EDI). EDI was a cumbersome technology, requiring the use of a third party (a value-added network supplier or VANS) to facilitate information flow, but it did enable business partners to reduce the costs of exchanging business documents such as orders, invoices and price lists with each other. Indeed, the advent of Financial EDI—the issuing of electronic payment instructions and receiving remittance notices electronically—was seen as closing the loop between purchaser and supplier. Of course, all parties involved had to adhere to particular technical standards in exchanging information and, as has been the case throughout the history of IT, a variety of different EDI standards emerged. Industries such as automotive, banking and retail had their own standards to define message structures. The United Nations did attempt to bring some uniformity to these diverse standards through UN/EDIFACT (United Nations/EDI for Administration, Commerce and Transport), but with mixed success.

With the opening up of the Internet for commercial activity in 1991, a vast new medium was emerging for the conduct of business transactions. This ‘network of networks’ was based on open standards, facilitating
easier connectivity without the need for the use of VANS. More latterly, the emergence of WAP (Wireless Application Protocol) has made it possible for mobile devices (phone, personal digital assistant [PDA], etc.) to connect up to the Internet, thereby permitting everything from ‘browsing the Net’ to engaging in business transactions while on the move. *M-commerce* has been coined to refer to the use of mobile devices for the conduct of business transactions while *t-commerce* refers to a similar use of television.

E-business, on the other hand, has come to refer to the automation of an organization’s internal business processes using Internet and browser technologies. At one extreme, we have the ‘pure play’ dot.coms, whose business models are often portrayed as being totally web- or Internet-enabled, often reaching out directly to customers. However, unless the product is digitizable, such companies do not exist totally in the virtual world. In industries such as retailing, manufacturing and transportation, the physical aspects overpower the virtual—logistics still wins the day, not glossy websites as many dot.coms have found to their detriment. At the other extreme, we have companies who have ‘web-enabled’ selected business processes using Internet technologies. Such companies still operate in the physical world and seek to develop a ‘bricks and clicks’ strategy to integrate the Internet with their mainstream operations.

Unfortunately, the potential benefits and impact of those aspects of IS/IT that have been labelled e-business, e-commerce and latterly m-commerce and t-commerce have been exaggerated, resulting in tremendous hype surrounding these concepts, much of it fuelled by technology vendors and the media. In 1999, just issuing a press release stating the company was embracing the ‘net’ or announcing an e-commerce strategy was enough to send a company’s share price rocketing. Subramani and Walden examined the impact of e-commerce announcements by firms on share price and found that e-commerce initiatives did lead to cumulative abnormal increases in shareholder value. Even changing a company name to incorporate the ‘.com’ label had a significant increase in the share price and trading activity.

Right up until the Nasdaq crash in March 2000, we could not fail to pick up a newspaper or magazine without reading a story about the Internet and its impact. Attention grabbing headlines such as ‘The “net” changes everything’, ‘Log on or log out’ or ‘The death of the job’ and articles spotlighting the 21st century economy with promises of change in the lives of everyone ensured that the Internet became a popular topic of conversation. Acronyms such as B2B (business-to-business), B2C (business-to-consumer), B2E (business-to-employee) and P2P (peer-to-peer) entered the business vocabulary.

Coltman *et al.* have evaluated some of the early predictions about the
Internet and what the reality is some years later. For example, Kalakota and Whinston\textsuperscript{13} predicted that brands would die—this has not been the experience. In fact, many ‘Internet brands’ have themselves become extinct—as many banks have discovered as they attempted to launch ‘Internet brands’. The prediction that the middlemen would disappear has again proved false. In fact, a new breed of ‘infomediary’ has emerged.\textsuperscript{14} Evidence also suggests that being first is not the key to success as suggested by Downes and Mui.\textsuperscript{15} Yahoo!’s real advantage is not that it was a first mover, but a ‘best mover’. If Lycos or some other portal is considered better, it is possible that Yahoo! will decline, as switching costs are low. In many cases, the early follower has the advantage of complementary assets, like brands, that form the real basis of competition for customers. This is what occurred in many industries when the incumbents took on the dot.com upstart. Yet, some predictions have come to pass. The claim that the Internet represents a new nearly ‘frictionless market’ has some empirical support. In a study of books and CD retailing, Brynjolfsson and Smith\textsuperscript{16} found that prices on the Net were 9–16\% lower than prices in conventional outlets.

What we are essentially looking at is another technology—in this instance, the Internet, including wireless technologies—to add to the range of technologies that already exist. The fundamental challenge for any organization is still to identify opportunities to deploy this new technology, as with any other. As Porter\textsuperscript{17} noted ‘[w]e need to move away from the rhetoric about “Internet industries”, “e-business strategies”, and a “new economy” and see the Internet for what it is: an enabling technology—a powerful set of tools that can be used, wisely or unwisely, in almost any industry and as part of almost any strategy’.

It should also be noted that IT is not the business strategy. Statements like ‘[i]n this new age, IT is not about the business—it is the business’\textsuperscript{18} are misleading and unhelpful.\textsuperscript{19} Rangan and Adner\textsuperscript{20} have dispatched sound advice in this regard. ‘The sooner firms stop being distracted by the hype of new technology, the sooner they can focus on the key strategy lessons that business experience of the past couple of decades has taught us: regardless of the industry that a firm operates in, it can achieve and sustain profitable growth to the extent that it grasps and delivers on two strategy fundamentals—product advantage and production advantage.’ In a similar vein, Hamel, in his book \textit{Leading the Revolution},\textsuperscript{21} is quite forthright in stating that ‘[t]he real story of Silicon Valley is not “e”, but “i”, not electronic commerce but innovation and imagination, … It is the power of “i,” rather than “e,” that separates the winners from the losers in the twenty-first century economy’.

Yet, this is not to say that the Internet is not different. Apart from its technical characteristics, three aspects make the Internet distinct
from other technologies. First, it is pervasive. For example, it directly reaches end consumers, facilitating the conduct of business directly with consumers in new ways—something which has not been possible before, except with dedicated systems like France’s Minitel. Interactive Digital TV allows consumers to access Internet services directly from the sitting room of their home. Second, it is interactive. This interactive element is of crucial importance since much business activity consists of interactions (human and technical communication, data gathering, collaborative problem solving, negotiation). Third, its virtual nature means that it is a new medium that has different characteristics from the physical world—often referred to as the marketspace as opposed to the physical marketplace. The marketspace denotes the transformation in business activity as moving from the physical marketplace with fixed locations, inventories and products to an information-defined transaction space. This shift ranges from basic business transactions such as ordering and invoicing to utilizing sophisticated business-to-business (B2B) exchanges and electronic marketplaces, bringing together industry players in a neutral market setting. This has implications for organizations’ brands, for understanding trust, for product and service pricing, for issues of location, for collaborative ventures, for collecting duties and taxes, etc. All of this implies that IS/IT strategy has to be even more tightly aligned to other strategies, especially the external relationships of the enterprise.

EARLY VIEWS AND MODELS OF IS/IT IN ORGANIZATIONS

The use of computers in business began in the early 1950s but really only became significant in the mid- to late 1960s with the development of multi-purpose mainframe computers. Major increases in processing speed, cheaper memory and improved storage capacity afforded by magnetic disk and tape, plus better programming languages, made ‘batch’ data processing a viable option for many tasks and activities in organizations. During the 1970s, minicomputers of increasing power and sophistication were used for a variety of business applications that were either not feasible or economic in a mainframe environment. However, the views developed of the role of information systems and their expected evolution were based strongly on a centralized, integrated concept derived from mainframe origins. The most well known of these models, capturing the evolution of IS/IT in an organization, was developed by Gibson and Nolan during the 1970s. This model, in turn, used a hierarchical application portfolio model described by Anthony, who defined a
structure for information systems in an organization, based on a strati-
fication of management activity into:

- strategic planning;
- management control;
- operational control;

Different applications were built to support the different levels of man-
agement activity—hence, it provided an early way of classifying applica-
tions. Typical systems developed to support this model are shown in
Figure 1.1.

Based on analyses of the use of IS/IT in a number of large US organ-
izations, Nolan and Gibson proposed an evolutionary model containing
initially four ‘stages of growth’. Later, two further stages were added by
Nolan. This six-stage model is summarized in Box 1.1. The analysis
involved considered six aspects or benchmarks of IS/IT and its
management in the organizations studied. These were (i) the rate of IS/
IT expenditure, (ii) the technological configuration (e.g. batch/online/
database), (iii) the applications portfolio (as in Anthony’s model), (iv)
the data processing (DP)/IT organization, (v) DP/IT planning and
control approaches and (vi) user-awareness characteristics.

The validity and usefulness of the six-stage model have been explored
by a number of researchers since it was published. In a review of
past research on Nolan’s stage hypothesis, Benbasat et al.\textsuperscript{29} and King
and Kraemer\textsuperscript{30} found that empirical support is generally weak and
1. **Initiation**: batch processing to automate clerical operations to achieve cost reduction, purely operational systems focus, lack of management interest.

2. **Contagion**: rapid growth as users demand more applications based on high expectations of benefits, move to online systems, high rate of expense as DP tries to satisfy all user demands. Little control if any, except a drive to centralize in order to control.

3. **Control**: in response to management concern about cost, systems projects are expected to show a return, plans are produced and methodologies/standards enforced. Often produces a backlog of applications and dissatisfied users.

4. **Integration**: considerable expenditure on integrating (via database) existing systems. User accountability for systems established and DP provides a service to users not just solutions to problems.

5. **Data administration**: information requirements rather than processing drive the applications portfolio and information is shared within the organization. Database capability is exploited as users understand the value of the information.

6. **Maturity**: the planning and development of IS/IT in the organization is closely coordinated with business development.
inconclusive. Drury\textsuperscript{31} noted that, in practice, the benchmarks did not map consistently on to the stages as suggested by the original model; in particular, in the later stages, the complexity of the real world was not reflected in the simplicity of the model. He concluded that, ‘Categorising of DP from initiation to maturity may no longer be feasible with the diffusion of new technologies and functions being introduced.’ However, he accepted that individual benchmarks could be usefully adopted in assessing how effectively an organization was coping with the increasing importance of IS/IT.

King and Kraemer\textsuperscript{32} believed that the model had several weaknesses. In particular, the empirical evidence for the stages was inconsistent and many of its assumptions were too simplistic to be useful. But they equally pointed out that many aspects of the model ring true to practitioners and researchers and it has had a considerable influence on IS management thinking since the 1970s. Its weakness—its simplicity—may be the key to its popularity! It does suggest an evolutionary approach during which different forces control the destiny of IS/IT in an organization. By the beginning of the 1990s, empirical research concluded that the model provided little help for the CIO or IT director attempting to create a successful IS unit within an organization.\textsuperscript{33} But despite its limitations, the model continues to be used by practitioners today.\textsuperscript{34}

More significantly perhaps, Wiseman, in his book \textit{Strategy and Computers},\textsuperscript{35} suggested that the influential combination of the Anthony three-tier structural approach to defining organizational systems and the ‘Nolan’ stage model inhibited the strategic use of IS/IT. He stated that, ‘up to 1983 at least, Nolan’s general purpose approach to information systems (based in part on the Anthony model) is clearly incomplete, for it offers no guidelines for identifying or explaining strategic information systems opportunities.’ Friedman,\textsuperscript{36} in analysing critiques of the Nolan model, suggested that, while evolution through the first four stages of the model was generally observable, the arrival in the 1980s of ‘strategic systems’ introduced a new stage that changed quite fundamentally the concept of how IS/IT evolves to ‘maturity’ in organizations and industries. Indeed, it is worth highlighting that stages-of-growth models have been applied to other areas of IS; for example, the evolution of the ‘information centre’, where there is empirical support for their evolution through the stages of growth. It is suggested that the various stages of information centre evolution are necessary in order for the information centre to better serve the changing needs of end-users.\textsuperscript{37}

In summary, a model of the evolving role of IS/IT in organizations is of value and, while the Nolan model is a useful starting point, it is not altogether satisfactory—it only really described events up to the 1980s and since then much has changed. Perhaps a more serious problem with
the Nolan model is in the detail of the four or six stages, and the undue emphasis placed by others since on the ‘rate of expenditure’ associated with each stage: Should it be more or less, increasing or decreasing, and so on? Focusing attention on the trees, one often loses sight of the wood! Viewed from a more distant perspective, the six stages of the model divide into two larger ‘eras’, separated by a transition point between Stages 3 and 4 (Control and Integration). It can be summarized as a transition from computer (DP) management to information (systems) management, during which major changes occur in who managed what for whom, and how. In essence, it was a fundamental change in how IS/IT resources were managed, and how the role of IS/IT in the organization should be evaluated. The changing relationships involved in the transition are depicted in Figure 1.2.

During the early stages of computerization, the preoccupation was with managing the activities—operations, programming, data collection, etc. Later, a separate organizational unit was established that could cope
with a variety of types of application, over an extended life cycle, during which the technology changed significantly. This ‘department’ was managed as a coordinated set of resources that were planned to meet expected future requirements.

While this was evolving, relationships with users developed, the effectiveness of any relationship being determined by success to date and the users’ awareness of the role computers could play in organizational activity—not because of business priorities, but due to the ease with which computers could be applied. Accounting was likely to be far more advanced in computer use than marketing, and if the ‘DP department’ reported to Finance then that relationship was likely to be very effective—but possibly at the expense of relationships with more business-critical parts of the enterprise. Occasionally, the role of IS/IT in the organization was reviewed but the focus on current issues and problems often prevented an overall picture being seen.

Up to this point, the main driving force had been managing computer resources and activities, with the effort applied, in proportion, to the technical and application difficulties, without much regard for the value to the business of the applications. To achieve effective Information (Systems) Management, a new top-down approach was required—a ‘strategy’ for the management of IS/IT, associated activities and resources throughout the organization. This should be based on a defined role for IS in the enterprise—but that, in turn, depends on the role of IS in relation to the outside world, as will be discussed later.

Research by Hirschheim and colleagues supported the rationale of this transition, based on studying the evolving issues associated with IS/IT management in organizations. They described it in terms of a three-stage model. The stages are described as:

1. **Delivery**: IS issues are mainly internal—improving the ability to deliver and support the systems and technology. Achieving top-management credibility as a valuable function is a prime objective. This means improving delivery performance, not necessarily providing users with what they really need.

2. **Reorientation**: establishing good relationships with the main business functions, supporting business demands through the provision of a variety of services as computing capability spreads through the business. The issues focus is extended outside the ‘DP department’ and a key objective is to provide a valued service to all business function management. Different areas will benefit differently without regard to business importance.

3. **Reorganization**: the high level of awareness created both ‘locally’ in the business area and ‘centrally’ in senior management creates the
need for a reorganization of responsibilities designed to achieve integration of the IS investment with business strategy and across business functions. A key objective becomes the best way of satisfying each of the differing business needs through a coalition of responsibilities for managing information and systems.

The last stage equates to the top-down, strategic view, while the first two describe the ‘climb’ to the position of considering the ‘role [of IS/IT] in the enterprise’.

**EARLY VIEWS AND MODELS: UP TO 1980**

The evolutionary models used so far have considered the management of IS/IT during the 1960s and 1970s and essentially from the inside— the development of IS/IT management rather than exploitation of IS/IT in the enterprise. During the 1970s, the types of application and how they could be developed changed, thus making the application models used as the basis of evolutionary analysis potentially obsolete.

Starting from the Anthony model of planning, control and operational systems, Nolan and Gibson showed how the applications, developed during the evolution of IS/IT, spread slowly up the hierarchy. Perhaps more importantly, they spread at different rates in different functions of the organization. These differential rates of evolution constrained the potential for integration of control and planning systems, which by their nature are cross-functional. Normally, a firm foundation of operational systems was built first, function by function. On this foundation, control systems were introduced by accumulating operational information and analysing it to improve cross-functional coordination and control. Finally, the portfolio was completed by transforming the information so that planning systems could be developed to help senior management define the future of the business. The control and planning systems forced improvements to be made lower down the portfolio structure, in order to realign information and its processing for planning and control purposes.

By the mid-1970s, approaches to developing successful operational systems, either centrally or on distributed minicomputers, were well established. Control systems, usually centralized, were particularly well understood and, especially in financial areas, could be linked to the required operational data, if only in a ‘read only’ mode. However, little progress had been made on planning systems beyond crude forecasting.

Traditional, mainly operational and control, systems were essentially of two types:
monitoring—transaction handling and control;
exception—triggered reporting and/or action.

Although these provide management with information, they are primarily focused on the processing of data, depending for success on the predefinition and consistency of requirements (i.e. data-processing systems that are primarily operational in nature, but may enable some control and planning).

In the early 1980s, the personal computer (PC) and a new set of software tools such as spreadsheets, word processors, electronic mail and presentation graphics, enabled ‘end-user computing’ (EUC) to take off. EUC was originally viewed as the direct, hands-on use of computer systems by users whose jobs went beyond entering data or transactions. At about the same time, ‘office automation’ systems provided new means of processing and communicating information. These advancements permitted two new functions to be added to the repertoire of IS/IT:

enquiry—flexible access to data and information initiated by user request;
analysis—decision support, with flexible processing of data and information.

Here, application needs are not predefinable, and often the applications changed rapidly during a short but useful life. They therefore tend to be characteristic of some control and planning systems, rather than operational systems. These applications essentially provide information to managers and professionals who require it and the ability to process/transform it to satisfy their information requirements.

The main differences between these types of application, named Data Processing and Management Information Systems after their primary objectives, are detailed in Table 1.1. Although these applications have different characteristics, they do to a large extent share a common information base and need to communicate—there is an obvious danger of total separation. Therefore, in addition to managing two different types of application, it became critical that the organization effectively organized its overall information resource.

It can be concluded that, from the 1960s to the early 1980s, IS/IT and its deployment in organizations passed through a major transition, which linked two eras. These two eras can be summarized as:

1. data processing from the 1960s onwards—the DP era;
2. management information systems (MIS) from the 1970s onwards—the MIS era.
Obviously, from this definition the two eras overlap—DP continuing to mature as MIS emerges and grows. As will be discussed later, the 1980s saw the beginning of a third era, which can be called the ‘strategic information systems’ (SIS) era. This book will focus considerable attention on the applications and implications of the third era, but it must also be remembered that:

- A considerable part of future investment will be in DP and MIS, and these investments must be part of any strategic plan.
- Much can be learned from the experiences gained in the first two eras to improve the chances of success in the third, when the potential prizes are greater, but the penalties for failure more severe!
- All organizations have to live with the legacy—asset or liability—of the applications previously developed, and often developed for reasons and using methods relevant to the past. Management and user attitudes and understanding of the potential of IS/IT and the IS/IT skills of the organization will in large part be determined by the nature of that legacy.

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<th>Operational and control systems (data processing)</th>
<th>Control and planning systems (management information systems)</th>
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<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td>Efficient transaction handling and effective resource control</td>
<td>Effective problem resolution and support for decision making</td>
</tr>
<tr>
<td><strong>Life cycles</strong></td>
<td>3–12 years, depending on rate of change</td>
<td>From hours to months and occasionally recurring</td>
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<tr>
<td><strong>Information time frame</strong></td>
<td>Recent history, current and short-term future</td>
<td>Consolidated history, current and extended future</td>
</tr>
<tr>
<td><strong>Information sources</strong></td>
<td>Internal plus external transactions</td>
<td>Internal plus external ‘research’ data</td>
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<tr>
<td><strong>Logical processes</strong></td>
<td>Strictly algorithmic</td>
<td>Probabilistic and ‘fuzzy’</td>
</tr>
<tr>
<td><strong>Users</strong></td>
<td>Operators, clerical staff and first line supervisors</td>
<td>Professionals and middle to senior managers</td>
</tr>
<tr>
<td><strong>Technologies</strong></td>
<td>Mainframe/minicomputer-controlled processing at workstations</td>
<td>Local processing linked to information resources</td>
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The implications for the organization are that a complex inheritance must be appropriately managed, improved and replaced, while current opportunities are exploited and future possibilities explored.

THE DP AND MIS ERAS: THE LESSONS LEARNED

There have been essentially three parallel threads of evolution that have enabled more extensive and better information systems to be developed:

- **Hardware**—reducing cost and size, improving reliability and connectivity, enabling the system to be installed closer to the business problem.
- **Software**—more comprehensive and flexible operating software and improved languages, enabling business applications to be developed more quickly, with greater accuracy and by staff with less experience. In addition, there was an increased availability of application packages available ‘off the shelf’.
- **Methodology**—ways of organizing and carrying out the multiplicity of tasks, in a more coordinated, synchronized and efficient way to enable ever more complex systems to be implemented and large projects to be managed successfully.

The ‘data processing’ approach is problem/task/process focused to ensure that the ‘automation’ through IS/IT of those tasks achieves the required efficiency improvements and thus benefits—the required return on investment. The relationship to business strategy development is similar to that of installing a new widget-making machine, which produces twice as many in half the time, needs fewer operators and produces a better yield from the material (i.e. enabling performance improvements). Similarly, automation of a warehouse improves efficiency and can improve inventory management, but does not fundamentally alter the business process—it is a more effective ‘implementation’ to support the achievement of strategic aims.

Automation through DP can, however, produce a competitive advantage. For example, the Aalsmeer Flower Auction (Verenigde Bloemenveilingen Aalsmeer) in the Netherlands computerized their auction clocks in the 1970s and linked the auction transactions to the time-critical administration and distribution systems. The speed and integrity of the systems enabled the auction to handle ever-increasing volumes, to the satisfaction of both the flower growers and the buyers—increasing the auction’s market and market share. Over the years, the exchange has developed a wider range of buying and selling systems, including
FlowerAccess.com, an information and order system, developed with exporters and wholesalers that enable florists worldwide to order directly. The VBA has also launched a remote system that allows buyers to take part in sales from off-site locations while watching several auctions from computer screens in real time.\textsuperscript{41} Computerized reservation systems (CRS) began life as DP systems to enable airlines to manage their inventory of seats but were soon giving them significant competitive advantage as well as becoming more profitable than their owners.\textsuperscript{42}

The problems of developing DP systems are generally well known, if not fully resolved, in most organizations. Consequently, they have been addressed most comprehensively. Even in the future, perhaps more than 50\% of all IS/IT investments will be about improving efficiency—‘data processing’ in their philosophy. Wiseman\textsuperscript{43} refers to the ‘hybrid nature’ of many major systems investments. He says that even so-called competitive or strategic systems such as the electronic ‘point of sale’ (EPOS) systems in retailing include a large data-processing component—data capture, verification, storage, processing, transmission—as well as providing important information that may be employed to improve competitiveness.

As more ‘data’ became stored in computer systems, managers realized that using the information could increase the effectiveness of decision making in their departments. Database software seemed to provide the means to give the necessary flexible access to information via online enquiry and analysis systems. Coupled with emerging modelling tools, new decision-support systems provided managers with the facility to manipulate data in ways not previously possible. This required managers to think about the information they used and how they used it. However, managers do not use data in predefinable, structured ways. Neither do managers rely solely on ‘hard facts’ in their decision making.\textsuperscript{44} The methods used successfully to construct large volume, structured DP systems did not work given the vagueness of the requirements. Neither could the cost involved be justified easily, given the intangible nature of the benefits and the potentially short life of the systems. Return-on-investment calculations did not look as attractive for MIS as they did for DP, even though both could be based on ever-reducing hardware costs.

The legacy of process-based DP applications, each one optimized in its construction to maximize efficiency, was often at best a fragmented data resource, at worst a chaotic mess of data with little or no integrity. Database disciplines required a heavy user involvement in data definition—a tedious and difficult task. Frustration developed as large restructuring projects were undertaken to reorganize data and applica-
tions into integrated data-based systems to enable MIS to be developed. Even when this was complete, the databases often proved inflexible—the users did not get the information in the way they needed it. IS specialists spent inordinate amounts of time on data analysis and design, and then still had to write mundane retrieval systems. The ‘response’ to the problem by IT suppliers was to introduce new languages—fourth-generation languages (4GLs)—which were easy to use on well-defined data, relational databases to overcome the constraint of rigid structures and personal computers to free the user from the tangled web of IS development. In particular, the personal computer brought with it the ‘spreadsheet’, which enabled considerable analytical scope without the need for programming.

Most IT departments eventually identified the need for new user-support services. A manifestation of this was the ‘information centre’. This was, by whatever name, a new service whose prime purpose was to support and encourage, but minimize the risks of, end-user computing. New relationships were established with users who had previously been on the verge of total rebellion! Many IT departments also adopted the new software tools and used them to improve the responsiveness and productivity of more conventional IS development. Agreement was reached on user and IT roles—which ‘systems’ aspects were to be entrusted to users and which needed the disciplines already developed. Appropriate organizational policies, rather than DP methodologies, could be established.45

In some organizations, however, rifts between users and IT professionals developed, causing active antagonism and consequent failure to resolve the issues of the MIS era. Often, the corporate information resource, instead of being integrated via the database approach, became fragmented as separate users either retained or regained control of their data. Frequently, the MIS applications became divorced from the DP systems—often resulting in, at best, unsynchronized and, at worst, totally different data being used to operate the business and manage it!

Into this arena, in the early 1980s, was thrust the concept of ‘office automation’—an unfortunate misnomer, which sent shivers of apprehension through those whose world was apparently about to be automated and offered a new opportunity for conflict between the IT professionals and user management. The net result was that more forms of information—not just data but text and potentially images and voice—could be channelled through the same technology. In some cases, this would enable more efficient information processing and, in others, provide better ways of communicating and presenting information, providing a more comprehensive matching of technology to the tasks of a typical manager.
Unfortunately, two factors served to confuse the progress in evolutionary terms that even the best-managed companies were achieving:

1. How was the large new investment required in hardware and software—many hundreds of workstations, networking costs and multiple licences for software packages—to be justified? This re-focused management’s attention on technology rather than its use—the much-quoted word ‘convergence’ distracted management from a need to ensure that their systems and information were appropriate and effective before throwing technology at the problem. Those organizations who succeeded with office automation were those who applied the lessons learned in successful DP and MIS investments to the extension of technology use. The rationale for investment had reverted, in many cases, from ‘business pull’ to ‘technology push’ and the management style often regressed accordingly.

2. How should the new applications and supporting technology be managed and, even more critically, who should be responsible? Should the role of the IT unit be extended or should such systems be the responsibility of users? Were the new office systems an extension to a department level of personal computing or an integral part of the organization’s information processing ability and resources? How did the management of personal computing and office systems relate?

As the new ‘strategic’ potential of IS/IT began to be appreciated in the mid-1980s, most organizations were still wrestling with the problems of managing concurrent DP and MIS applications based on rapidly-evolving technology. Policies, planning, organization structures and processes were established to control and coordinate the increasingly diverse and complex requirements. Good practice in the planning and management of DP and MIS was hard won after a long fight. The extended business role, now envisaged, did not undo that requirement—much of the future investment would be of a ‘traditional’ nature and would produce more benefits if well planned and managed. DP and MIS applications might be less glamorous but management should equally expect them to be more certain of success. Table 1.2 summarizes a number of the key lessons from the first two eras.

Paul Strassman, in his book *The Information Payoff*, assessed the contribution of IS/IT to businesses from a careful examination of the essential premises of the first two eras (i.e. that DP delivers increased efficiency and that MIS improves management effectiveness). From his many observations and conclusions, the following are particularly important:
IS/IT deployment has generally improved the efficiency of information-based functions in organizations when technology is used to automate discrete, structured, repetitive, stable information-intensive tasks (e.g. invoicing, accounting, order handling, word processing,

Table 1.2  Summary of lessons from DP and MIS eras

**DP lessons:** Need to understand the process of developing complete information systems, not just the programs to process data.

More thorough requirements and data analysis to improve systems linkages and a more engineered approach to designing system components.

More appropriate justification of investments by assessing the economics of efficiency gains and converting these to a return on investment.

Less creative, more structured approaches to programming, testing and documentation to reduce the problems of future amendments. More discipline was introduced with ‘change control procedures’ and sign-off on specifications and tests.

Extended project management that recognized the need for co-ordination of both user and DP functions and the particular need to establish user management in a decisive role in the systems development—the user had to live with the consequences.

The need for planning the interrelated set of systems required by the organization. Better planning produced overall improvements in systems relevance and productivity.

**MIS lessons:** Justification of IS investments is not entirely a matter of return on investment/financial analysis.

Databases require large restructuring projects and heavy user involvement in data definition—data integration had been weak based on the project by project DP approach.

The IS resource needs to move from a production to a service orientation to enable users to obtain their own information from the data resource—the information centre concept.

Need for organizational policies, not just DP methodologies.

Personal computers and office systems enable better MIS to be developed, provided that users and IS specialists both focus on the information needs rather than the technology.
etc.). However, the return on investment is lower than the often-quoted figures such as 25–30%; a net 5–10% return is more likely, although some isolated spectacular gains are possible. Efficiency gains can and should be measured wherever possible, although this can be difficult if tasks are rationalized or integrated when computerized.

- The results with regard to management effectiveness are less consistent. First, measuring effectiveness improvements—‘value added’ of managers—is difficult. Strassman’s measurements considered management’s contribution in terms of profitability or those aspects of profit that managers can influence against the costs incurred by management. When IS/IT is added to this cost burden, how does it affect the value-added side of the equation? According to Strassman’s research and analysis, the expected happens: good managers get even better; bad managers get worse! This is explained as follows: good management, with a high and improving value/cost ratio, will use new resources to increase their effectiveness further by focusing on adding more value still—getting better at their job—or they will discard the technology. Poor management will focus on improving the value/cost ratio by reducing the cost component and will be looking for IS/IT to produce efficiency savings—implying automation, but of tasks that do not lend themselves to automation. This piecemeal automation approach misses the opportunity to improve personal and collective effectiveness. It could be argued that IS/IT in these circumstances speeds up the mess! It is therefore important to deal with the basic reasons for low management productivity and effectiveness before employing the technology.

More recent surveys and further work by Strassman, using the same approach, have verified these observations, especially where IS/IT is introduced into complex organization structures.47

THE THREE-ERA MODEL

Thus far in the evolution of the role of information systems and technology in organizations, two eras have been identified and discussed. There is, in fact, a third era that began in the early 1980s and provides a focal point for this book. This third era can be referred to as the strategic information systems era, and it will be discussed at length in the next section.

Although it is tempting to simplify nearly 50 years of often-haphazard, uncertain progress with the benefit of hindsight into three, albeit over-
lapping, eras, it must be remembered that it is never that simple. A ‘three-era model’ is proposed from which a number of insights can be drawn that help in planning or developing strategies for the future. While the three-era model is easy to criticize as being oversimplistic, it has proved popular with a number of IS/IT theorists and researchers. Hence, many useful analyses are available from which a pattern of conclusions can be drawn. It is first worth clarifying the fundamental differences and interdependencies of the three eras.

The prime objective of using IS/IT in the eras differs:

- *data processing* to improve operational efficiency by automating information-based processes;
- *management information systems* to increase management effectiveness by satisfying their information requirements for decision making;
- *strategic information systems* to improve competitiveness by changing the nature or conduct of business (i.e. IS/IT investments can be a source of competitive advantage).

The objectives of DP and MIS are, strictly speaking, a subset of the SIS objective—to improve competitiveness. But this tends to be achieved indirectly by using IS/IT to improve current business practices. For example, the focus of business process re-engineering (BPR) is often seen as improving competitiveness, but this is achieved through process redesign taking into account the capabilities of IT in providing new and innovative design possibilities. While the SIS objective is more immediately related to the business, success in achieving the DP and MIS objectives can contribute considerably to business success, and further improvements are always possible as IT capabilities are enhanced and the cost reduces.

Galliers and Somogyi, in the book *Towards Strategic Information Systems*, plot the erratic progress of IS/IT, its use and its management through the two eras (note that their Management Services era is what we refer to as MIS) and into the then emerging third era of strategic information systems. They recognized a number of important trends that occurred during that evolution, including the move into the third era. These trends are summarized in Figure 1.3, in the terms used above.

Wiseman has perhaps most succinctly described both the relationship between the three eras and the evolving application portfolio and the application objectives. His key points are:

- Just as good MIS systems rely on good operational DP systems for accurate, timely information, strategic information systems (such as
those linking the company directly to its customers via the Internet) rely on good DP or MIS systems for appropriate information provisioning or dependent processing. Many companies have established websites permitting customers to place orders online, but not yet integrated them with order processing and other back-office systems.

- Strategic information systems are not essentially different applications—the functions are often the same as for DP or MIS applications—it is their impact on the business due to the changes they enable or cause that is different.
- The strategic applications may put considerable stress on the DP and MIS applications that were developed for a less demanding environment—they may need to be redeveloped not because of intrinsic shortcomings but because they inhibit the benefits to be gained from the SIS.

It must be emphasized that ‘eras’ is not perhaps the ideal word, suggesting as it does a sequential relationship. The DP era is still with us, the ever-improving economics enabling the technology to be applied to extend the automation of processes involving documents, images and voice. So, too, with MIS. A combination of improved economics, more

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**Figure 1.3** Trends in the evolution of business IS/IT (source: adapted from R.D. Galliers and E. Somogyi, ‘From data processing to strategic information systems: A historical perspective’, in R.D. Galliers and E. Somogyi, eds, Towards Strategic Information Systems, Abacus Press, 1987)
powerful processing capability, sophisticated software and the availability of external data enables the collection, analysis and presentation of information to be made more comprehensive and effective.

**THE STRATEGIC INFORMATION SYSTEMS ERA**

During the late 1970s, a number of organizations had began to use IS/IT in ways that fundamentally changed how their business was conducted, changing the balance of power in their industry with respect to competitors, customers and/or suppliers. The use of IS/IT was thus directly influencing their competitive position and had become a new weapon to improve their competitiveness, implying a new relationship between IS/IT investment and strategic development.

Among the earliest examples of competitive advantage from IS/IT were the SABRE reservation system of American Airlines and the direct terminal-based ordering system of American Hospital Supplies. Both involved putting technology directly into the customers’ sites, and, in the process, precluded similar competitive responses—who wants two or more terminals on their desk?—but also caused fundamental changes in the ‘systems’ operating in their industries, to their advantage. These two particular cases are extensively documented, along with a number of others—United Airlines, Merrill Lynch, Thomson Holidays, ICI, McKesson, and Dun & Bradstreet.

During the mid-1980s, an endless stream of examples were quoted in many journals and books on SIS under the generic title of ‘how IS/IT provides competitive advantages’. These articles often did more than describe what organizations had done: they considered how the advantage had been achieved and proceeded to suggest how any organization might analyse its business and identify similar opportunities. In many cases, a tool or technique was described and substantiated by selected examples. Although these various approaches will be considered in detail later, it is important to note at this stage that they are all fundamentally different from the analysis approaches traditionally employed regarding the deployment of IS/IT. They are therefore additional tools and techniques that need to be included in the IS/IT strategy development and planning toolkit. However, they need to be considered in the overall context of both business strategy and IS/IT strategy, as will be demonstrated later.

It is worth noting at this stage that, although some of the ‘classic’ competitive advantage examples resulted from a formal approach to strategy development, most were the product of excellent exploitation of situations that arose in the course of business. As a result of his
research into strategic information systems, Ciborra\textsuperscript{51} asserted that successful applications are often due more to serendipity than any formal approaches to planning. The various tools and techniques that have been developed subsequently should enable organizations to reduce the amount of luck required.

Recently, attention has returned to some of these classic examples. Kettinger \textit{et al.}\textsuperscript{52} analysed some 30 of the best known examples, 10–20 years after their initial implementation, to determine whether the advantages achieved by these systems were sustained. Clearly, over such an extended period, many factors can affect a firm’s performance, and the results are at best indicative rather than conclusive. In general, they found that, while some 40\% of the firms had above-average performance for a few years, only 20\% could be said to have sustained the advantage for 10 years or more. However, this is probably to be expected given the advances in technology over the period and, hence, the relative ease of replication (at lower cost) of many of the systems. We shall return to this point again at the end of the chapter, as we believe that the lessons from this and other research studies provide the background to a new fourth era.

\textbf{STRAIGHT USES OF IS/IT: CLASSIFICATION, FACTORS FOR SUCCESS AND MANAGEMENT IMPLICATIONS}

From a research base of over several hundred examples and case studies spanning 20 years of claimed ‘strategic systems’, the following classification can be shown to be helpful in considering the implications of strategic IS/IT use. In general, the examples can be classified into one of four types, although some of the examples clearly exhibit the characteristics of more than one type.

The four main types of strategic system appear to be:

1. those that share information via technology-based systems with customers/consumers and/or suppliers and change the nature of the relationship;
2. those that produce more effective integration of the use of information in the organization’s value-adding processes;
3. those that enable the organization to develop, produce, market and deliver new or enhanced products or services based on information;
4. those that provide executive management with information to support the development and implementation of strategy (in particular, where relevant external and internal information are integrated in analysis).
Other classifications are somewhat similar in their analysis. Benjamin et al.\textsuperscript{53} divided the types of potential opportunity between those that focus on either the competitive market place or internal operations. Within each, IS/IT can be used to improve traditional ways of doing business or to cause ‘significant structural changes’ in the way the company does business. Notowidigdo\textsuperscript{54} divided strategic information systems into:

- internal systems that have direct benefit for the company;
- external systems that have direct benefits for the company’s customers.

A similar approach was adopted by Venkatraman\textsuperscript{55} in assessing how the strategic benefits from IT resulted from increasing degrees of business change (and risk!). He considered the early ‘evolutionary’ stages of IT use in much the same way as described earlier in this chapter for DP and MIS. However, he described three types of ‘revolutionary’ uses of IT, which require considerable transformation in terms of what the organization does or how it does it:

1. *business process redesign*—using IS/IT to realign business activities and their relationships to achieve performance breakthroughs;
2. *business network redesign*—changing the way information is used by the organization and its trading partners, thereby changing how the industry overall carries out the value-adding processes;
3. *business scope redefinition*—extending the market or product set, based on information or changing the role of the organization in the industry.

While not identical, these options are similar to the classification we have developed, with a clear emphasis on the extent of the changes to achieve a strategic advantage from IS/IT. Hence, the four categories suggested above seem to cover many of the possibilities. Each of these types of strategic IS/IT application has different implications in terms of identification, planning and implementation.

**Linking to Customers and Suppliers**

The key people involved in the consideration of external linkage systems will be sales/marketing and distribution management at the customer end, or purchasing/receiving/quality-control managers at the supplier end. The initiator of American Hospital Supplies’ strategic IS developments was a depot manager who provided a disorganized customer with a
Box 1.2 Case examples of IS/IT and competitive advantage through the decades

**Merrill Lynch**
In the USA, Merrill Lynch launched its cash-management account back in 1978. This combined traditionally separate banking products such as line of credit, cheque, investment and equity accounts into a single monthly statement, with idle funds being swept automatically into a high-interest-bearing account. The new accounts attracted US$1 billion of assets in the first year. Merrill Lynch set out to change the shape of the financial marketplace permanently by taking several existing but separate services and tying them together through information technology to create a new service that shattered the traditional boundaries between the banking and securities industries.

**American Hospital Supply**
American Hospital Supply competed in the wholesale health-care industry in the 1970s and 1980s. To gain an important edge over its rivals, AHS pioneered an order entry distribution system that linked most of the firm’s customers to its computers. AHS-owned terminals were placed directly in the purchasing departments of hospitals, giving them an early mover advantage—hospitals didn’t wish to have multiple terminals from different vendors cluttering up their offices. In addition to ordering merchandise, the system allows customers to control their inventories by having direct access to AHS’s stock records, increasing the likelihood of their coming to rely upon AHS as a key supplier. The fact that the company’s initial move to electronic ordering was spearheaded by a regional manager seeking to meet the needs of a single customer suggests that starting small may be the key to success.

**American Airlines**
American Airlines gained a lead over the competition as the first US carrier to offer an online reservation system to travel agents. This system, Sabre, captured 10,000 of the 24,000 travel agents in the USA. Sabre listed the flight schedules of over 400 airlines, but, when launched, it gave American a crucial edge by displaying its own flights first. So effective was this tactic that other US carriers persuaded the Government to intervene. American still benefited, however, by charging for every booking made, bringing in significant revenue. In fact, Sabre was more profitable than the airline itself.
Otis Elevators
In the 1980s, Otis Elevators, the US manufacturer of elevators, identified ‘customer services’ as being a key element of its customer strategy. It decided that one of the aspects of its service that would give its customers most satisfaction was a prompt lift repair service. So, it built an automated system, called Otisline, to dispatch repairmen. Where something started to go wrong with Otis’ lifts, they (the lifts!) automatically called in their complaint to a computer—without human intervention. Otis’ rivals suddenly had to compete on quality of service as well as the price and quality of lifts themselves.

Schneider National Inc.
Schneider National Inc. is a large truckload carrier based in the USA. 1980 saw the advent of deregulation in this traditional industry and Schneider recognized, earlier than most, the strategic potential of IT. Over the years, the company has developed many applications in order to stay ahead of the competition. The company moved from freight modelling applications, to EDI, to satellite technology with onboard terminals, to incorporating these satellite data into customer communications and load scheduling processes. While each application of technology gave them a significant advantage in the marketplace, their competitors soon developed similar applications and it quickly became standard for the industry. Yet, while the competition was looking to imitate Schneider, they had already moved on to develop a new strategic application. In essence, the competition was continually playing catch-up. Schneider continues to apply its IT capability as it moves into logistics outsourcing. While logistics is an entirely different business from trucking, it similarly depends on fast, cost-effective, strategic implementations of IT. Schneider is not successful because of any particular leading-edge technology, which is also available to its competitors, but because it has developed a capability for applying IT to ever-changing business opportunities.

Amazon.com
Amazon.com is an Internet venture that was launched in July 1995, and has probably become the most famous site in cyberspace. It initially started out with a mission to use the Internet to transform book buying into the fastest, easiest and most enjoyable experience possible. Jeff Bezos, its founder, selected book retailing as it was a
fragmented industry, with the two biggest booksellers at the time accounting for less than 12% of total books sales. Unlike traditional bookstores, there are no bookshelves to browse at Amazon.com. From the website, customers can search for a specific book, topic or author, or they can browse their way through the book catalogue. Visitors can also read book reviews from other customers, the New York Times and other newspapers and magazines. Customers can browse and then complete the sale by entering their credit card information—in the early days, customers placed their orders online and then phoned in their credit card information. Orders are processed immediately and books in stock, generally best-sellers, are shipped the same day. Customers are contacted by email when their order has been dispatched. Orders for non-best-sellers are immediately placed with the appropriate book publisher by Amazon.com. All contact with the company is done either through their World Wide Web site or by email.

Over the years, the company has also expanded into other areas and now sells CDs, consumer electronics, toys and games, and tools and hardware. It has also branched out into electronic auctions. The company has also pioneered technologies such as customer profiling and ‘1-click’ shopping. The profiling technology has enabled Amazon to recommend books based on previous purchasing history and what other customers who have bought similar books are also reading. In selling CDs, it permits shoppers to listen to excerpts. Even today, the company strives to maintain their founding commitment to customer satisfaction and the delivery of an educational and inspiring shopping experience.

**Bootsphoto.com**

Boots the Chemist have developed a website Bootsphoto.com to extend the company’s existing photo-developing business. The site offers customers the option to have photographs digitized, uploaded and stored on the Bootsphoto.com website. Users can order reprints or enlargements online and create web-based photo albums. By sharing passwords, friends and family can independently view and buy the same photos. While uploading and storage is free, prints are charged for. Boots argue that putting the service online widens the potential number of customers for prints—already a high-margin business.

‘Once people have created their online albums, they are not going to want to move them. It’s like setting up a bank account and that’s
an incredible asset for customer loyalty,’ say Phil Douty, head of Bootsphoto.com. Although customers can order and pay for prints online, they will also be able to drop off and collect films at any store.

**LeatherXchange.com**

The worldwide leather industry is highly dispersed, ranging from slaughterhouses and tanneries of developing countries to the manufacturers of luxury leather goods in France and Italy. It is also highly fragmented, with thousands of agents and traders. The biggest company has less than 1% of the market. The absence of common standards in the industry means that the quality of skins and hides varies a great deal. Up to 40% of international consignments are often turned back by dissatisfied buyers, while tanneries are obliged to carry large inventories to make up for the uneven quality of supply.

LeatherXchange.com was established as an online leather exchange to capitalize on the opportunities that the state of this industry offered for an Internet exchange. Hundreds of suppliers are posting their prices and products on the website. Users pay an annual membership fee, plus fees based on their online transactions and use of LeatherXchange’s search engines. The site has also developed standards that are now posted on the site to help buyers and suppliers in their negotiations, as are industry contracts to govern agreement between buyers and sellers. The exchange is also planning to launch an inspection service that will provide quality certificates for suppliers.

**Ryanair**

Ryanair is one of the world’s most successful ‘low fares’ airlines. To support this strategy, the company has looked to the Internet to provide a low-cost distribution channel for its seats. Its online booking facility was launched in 1999, migrating customers away from the more expensive travel agent and call-centre channels. Customers can now search for flights online and book them with a credit or debit card. As a ticketless airline, the customers are supplied with a reference number which is given to staff at check-in. Over 90% of ticket sales are now taken on the website, which is also available in a number of languages including French, German, Swedish and Norwegian. In addition, the site also sells travel insurance, car hire and hotel accommodation. Competitors such as easyJet and Go! have similarly attempted to migrate customers to the Internet.
terminal through which he could place emergency orders. These applications require a strong drive from the sharp-end line management. Also, they are not entirely in the organization’s power to control—since suppliers, customers and competitors may take the initiative at any stage—and obviously any such system will require the cooperation of trading partners. e-Procurement and web-based ordering systems have enabled new, but low-cost linkages with customers and suppliers, some systems even permitting customers to track online the progress of orders.

**Improved Integration of Internal Processes**

To produce effective internal integration of information requires the organization to overcome some of the traditional barriers to successful IS/IT application in the DP/MIS eras: sharing information, reorganization of roles, etc. For instance, telemarketing, for routine selling, can dramatically reduce the cost of generating orders. But, imagine the reaction of a good customer to a telephone call suggesting a reorder when he has just received a final-demand letter from the Accounts Department for payments for goods he did not receive to use on a machine that is idle due to a service engineer calling without the right parts! All of the relevant information about the customer and the organization’s ability to deliver is required at the point of selling to make it effective. This is what organizations are seeking to achieve with the implementation of customer relationship management systems (CRM).

Enterprise resource planning (ERP) are configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization.

Senior management need to understand the organizational implications of this new information-based approach to the roles of people and departments, since reorganization will probably be required if significant benefits are to be obtained and any relative advantages sustained.
Information-based Products and Services

The classic example of enhancing the product/service, based on information, is the Merrill Lynch Cash Management Account, a consumer service that combines cheque, credit, savings and investment facilities. Unlike many of the examples, this concept resulted from strategic planning in the corporate planning department, where it was realized that a whole range of financial services were converging. Merrill Lynch realized that providing an information service to customers about what are information-based products could be very lucrative. More recently, online banking has incorporated a similar logic.

To achieve advantages in this type of application requires a thorough knowledge of the products of the industry, their relative merits and, in particular, what the customer uses them for and how the customer obtains value from them. Obviously, an understanding of the organization’s own products and services and the economics of providing them is also required.

The ventures into ‘direct’ selling and servicing of financial-service customers from call centres, pioneered by First Direct and Direct Line, were initially examples of Category 2 above (i.e. improved delivery based on internal integration of processes and systems). The products were essentially the same as those of competitors, but they were delivered directly to consumers via the telephone rather than via agents or branches. However, they could perhaps be considered as new types of product based on the quality of service provided and the focus on the set of banking and insurance needs of individuals. They clearly have made a significant impact on the market, given the development of similar product/service offerings by more traditional organizations such as the Halifax and Canada Life.

In using the Internet, many organizations have looked to add more value to the tangible products they sell by providing additional ‘information-based’ services. These can include online support, order tracking, order history, etc. Many of these initiatives focus on deepening the relationship with customers and suppliers. Others have moved their trading platform either partially or entirely onto the Internet (e.g. the auction house Christie’s and the Aalsmeer Flower Auction, mentioned earlier). Using e-procurement, RS Components permits its customers to ‘empower’ their employees to make purchases from RS’s website of non-core, low value (less than £300) items, with RS managing the total process, including establishing purchasing controls. These purchasing control rules cover specific pricing, spending limits, barring the ordering of particular products, cost codes, blanket orders, and order passwords.
Executive Information Systems

The final type of strategic IS/IT application—to provide executive management with information to support strategic decisions—is dependent on other factors for success. For strategic decisions, senior executives need organized information about markets, customers and non-customers; about technology in one’s own industry and others; about worldwide finance, and the changing world economy. In addition, the experience of the decision maker is also important. Often, intuition or ‘gut feeling’ plays a large part in some decisions.

Management information systems, historically at least, rarely satisfy this information requirement and, thus, make little impression on top management in the organization. There are two main reasons for this: (i) the lack of external information included in the systems and (ii) the simplicity of the systems, the rawness of the data, the lack of context (i.e. they require knowledge, not just information).

Recent developments in external business databases, which are readily tapped into using the Internet, plus the potential offered by knowledge-based (or expert-type) systems and scenario planning systems to process and explore options based on information and experience, have made this use of IS/IT more practicable. To date, this type of application provides the smallest number of examples.

Figure 1.4 summarizes the different views of strategic information systems, their context and focus. The dimensions of Figure 1.4 show the changing role of IS/IT—efficiency and effectiveness of existing activities (i.e. improving how things are done, changing what the business does

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Operational efficiency</th>
<th>Management effectiveness</th>
<th>Business advantage through change</th>
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<td><strong>Focus</strong></td>
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<tr>
<td>External</td>
<td>4. Electronic links between organizations automating data exchanges</td>
<td>5. Sharing information by direct access from one company to another’s information resources</td>
<td>6. External business integration, changing the roles of the firms in the industry</td>
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</table>

Figure 1.4 The information systems management environment
or how the organization functions)—and the changing focus of investment, from internal to external. In the Figure, electronic data interchange (EDI) or e-commerce, at its basic level of automating existing business transactions, is not considered strategic since it merely improves the efficiency of transaction handling. Also, executive information systems (EIS) have been included under MIS since the majority are ‘higher-level’ versions of MIS; only a few fit the ‘strategic’ description given above. The other three components of the matrix reflect similar ‘transformations’ as described by Venkatraman and others.

SUCCESS FACTORS IN STRATEGIC INFORMATION SYSTEMS

A second aspect of the analyses of our research base identifies some of the key factors that seem to recur frequently and underpin success. Few strategic information systems show all of the factors, but many show a number. Again, these factors are often at odds with traditional IS/IT approaches and show more commonality with business innovation.

1. **External, not internal, focus**: looking at customers, competitors, suppliers, even other industries and the business’s relationships and similarities with the outside business world. Traditionally IS/IT was focused on internal processes and issues. Toshiba is using wireless technology for remote monitoring of photocopiers, so that technicians can be dispatched as soon as there are signs of a problem. This reduces servicing costs and, since machines are out of action less often, increases usage and revenue.

2. **Adding value, not cost reduction**: although cost reductions may accrue due to business expansion at reduced marginal costs, ‘doing it better, not cheaper’ seems to be the maxim. This is consistent with the requirements of companies to differentiate themselves from competitors—better products, better services—to succeed. Historically, IS/IT was seen as a way of increasing efficiency—doing it cheaper—and, while this is obviously important in any business environment, it is not the only way to succeed. At Svenska Cellulosa Aktiebolaget, a Swedish pulp and paper company, foremen use a wireless system to send instructions to loggers in the field, specifying which trees to cut and in what order. This enables the company to coordinate harvesting decisions with inventory and transport requirements and match those decisions to market needs.

3. **Sharing the benefits**: within the organization, with suppliers, customers, consumers and even competitors on occasion! In many cases in the past, systems benefits have not been shared even within
an organization, but used instead to give departments or functions leverage over each other. This reduces the benefits and does not allow them to be sustained. Sharing benefits implies a ‘buy in’, a commitment to success, a switching cost. Almost all of the examples involve sharing the benefits, with suppliers, customers, consumers and competitors, to provide barriers of entry to the industry. For instance, the introduction of debit cards to replace cheque books depended for its success on banks sharing some of the reduced processing costs with the retailers and consumers, since the benefits that the bank could gain depended on the commitment of retailers and consumers. Some would argue that this was achieved by increasing the cost of the alternative (i.e. cheques!).

4. **Understanding customers** and what they do with the product or service: how they obtain value from it, and the problems they may encounter in gaining that value. In the 1980s, McKesson, the pharmaceutical wholesaler, followed this principle very closely in providing a range of information-based services to drugstores, starting from a simple problem of stock control, solved by delivering products in shelf-sized batches. Black and Decker, a low-cost producer, supplied a value-added service to retailers to enable them to ‘swap’ goods they had over or understocked for the season. They did not want returns, but the retailer could not be expected to predict precisely how many lawnmowers, for instance, would be sold. It helped to solve a customer’s problem. Federal Express has built on its original customer-service system, which tracks every movement of every package, and extended access direct to customers.

5. **Business-driven innovation, not technology-driven**: the pressures of the marketplace drove developments in most cases. This tends to cast doubt on the idea of competitive advantage from IT, but, in practice, it means that new or existing IT provides or enables a business opportunity or idea to be converted into reality. The lead or the driving force is from the business, not necessarily a traditional route to using IS/IT, which has often been driven by technology, pushed by the IT suppliers and professionals, not pulled through by the users. It is only relatively recently that the latest technology has become of interest to business managers. But the business issue does not change: why take two risks at the same time—that is, a new business process based on new technology? It is a recipe for failure! Keen summed it up well by saying, ‘Major failures in using IT are often based on much better technology and bad business vision. Successes come from good enough technology and a clear understanding of the customer.’ An early prediction of the demise of many dot.com ventures?
6. *Incremental development*, not the total application vision turned into reality. Many examples show a stepped approach—doing one thing and building on and extending the success by a further development. To some extent, this is developing applications by experimentation but also not stopping when a success is achieved but considering what could be done next. This, again, is against the traditional notion of clarifying all requirements, defining all boundaries and agreeing the total deliverables of the system before embarking on the expensive, structured process of design and construction, freezing the requirements at each stage. Prototyping of systems obviously has a key role to play here.

7. *Using the information gained* from the systems to develop the business. Many mail order and retailing firms have segmented their customers according to the purchasing patterns shown by transactions and then providing different, focused catalogues or special offers. Product and market analyses plus external market research information can be merged and then recut in any number of ways to identify more appropriate marketing segmentation and product mix. This aspect has been exploited particularly well by the ‘direct’ insurers, who are able to target the lower risk, more profitable customers very accurately. Through using the information gleaned from customer transactions, the Britannia Building Society in the UK has developed a sophisticated segmentation strategy based on creating customer propensity models, which have helped the Society increase the average number of products per customer from 1.3 to over 2.0.57

Before Safeway introduced its loyalty card scheme, they knew virtually nothing about customers. They didn’t know who they were, what they bought or even if they were the same customers who shopped at the store the previous week. By introducing a loyalty card scheme, it persuaded customers to tell them what they bought, and yielded significant information such as: most customers aren’t profitable; average shopping range is 250 lines; women are 50% impulsive, men 90%; customers shop for concepts not commodities (e.g. Sunday lunch, kids treat, Italian meal); Feta cheese is the 298th most popular cheese on units sold, but leaps to 25th in terms of basket size.58

As discussed above, these factors, in general, imply different attitudes to the use of IS/IT than have prevailed in the past, implying that we need new ways of thinking about IS/IT techniques to uncover such opportunities, and then new approaches to managing these applications to ensure success.

Another general observation can be made from these examples, by considering what actually produces the success—information technology,
information systems or information. Technology itself is the ‘enabler’, which provides short-term advantage and the opportunity to develop new systems and to capture and use potentially valuable information. But, normally, competitors will be able to purchase the same technology, and any advantages could soon be negated. However, the new information systems that developed, utilizing the technology, could provide advantages that may be less vulnerable to erosion by competitive copying. The potential gain will depend on how conclusively and exclusively the systems alter business processes and relationships.

In time, however, the existing competition or new entrants enticed into the profitable parts of industry could redefine the relationships by introducing alternative information systems. If the firm wishes to sustain its competitive advantage, it must use the information gleaned from its systems to improve its products or services—to match the requirements of the marketplace or influence its development.

THE MANAGEMENT IMPLICATIONS

By viewing IS/IT evolution another way, we can portray the management implications ascending from the basement of the business to the penthouse executive suite, from where strategic vision is possible and, more importantly, IS/IT can be incorporated into senior management’s ‘theory of the business’. Figure 1.5 attempts to summarize the changing focus.

The focus of data processing was, and still is, on the effective application of systems and technology to automating operations and thereby increasing efficiency. The planning focus is therefore on the business tasks involved in the project—the application and its successful design and implementation. The main prerequisite for success is a design for the system that carries out the operation to improve efficiency.

Management information systems involved user management in considering the information they used and how they used it. The IS professionals had to find new techniques of information analysis (such as data modelling and entity analysis) to devise ways of organizing and delivering information for effective use by management. Since managers rarely rely on a single source for information, the focus of planning has moved to the integration of individual systems into coherent sources of management information.

Before the SIS era, the view of IS/IT in the business was an internal resource, over which management had total discretion as to its use. The portfolio models mentioned earlier described the overall structure and logic of the process of IS/IT application to the business. It was very
much an internally-driven choice as to whether, and how much, to invest in IS/IT. IS/IT strategic management in the SIS era is different for two main reasons. First, the outside world (i.e. competitors, customers and suppliers) may be the instigators of IS/IT uses that affect the organization’s own need for new types of applications—external as much as internal factors drive the needs. Second, executive management have to make judgements about such investments in terms of how they will affect the business strategy of the organization and, in some cases, how IS/IT can be used to shape that strategy. Management need some way of assessing the importance of IS/IT in business terms, and the opportunities need to be elicited via business-based techniques to enable that management judgement to be applied. These two needs have been grouped together under the terms competitive impact analysis—ways of understanding the potential of IS/IT from a business strategic perspective—and strategic alignment of investment in IS/IT with the overall objectives and direction of the organization.

In summary, the contribution and performance of IS/IT in the business has become more significant, hence the level of management
involvement required has been elevated to executive level—no longer is
their task to sign the cheque; they now have to understand and often
decide what is being purchased. However, a note of caution is needed to
avoid overstating the importance of IS/IT. As early as 1987, King expressed concern that he saw ‘evidence that the competitive advantage
argument is beginning to be used excessively—primarily to rationalise
projects that cannot otherwise be justified.’ This causes the idea to lose
management credibility. He noted that we must manage IS/IT and its
various applications in accord with the type of contribution it is
making—improving efficiency, effectiveness and/or competitiveness
through business change—not elevate all aspects to a new and artificial
plane of importance. But, of course, an organization cannot afford to
ignore the strategic opportunities that IS/IT may offer, and, therefore,
‘the potential of information as a strategic resource should be incorpo-
rated as a routine element of the business planning process, so that all
managers become used to thinking in these new terms.’

Earl supports the argument that focusing on the technology itself
does not lead to its successful strategic application. He suggests that
the most effective route to achieving strategic benefit from IS/IT is to
‘concentrate on rethinking business by analysing current business
problems and environmental change—and considering IT as just one
ingredient of the solution.’ He called for the distinction to be made
between IS strategy and IT strategy. This he did as he found that
most of the IT strategies, at that time, were strong on technology
issues and technical terminology and weak on identifying application
needs and business thinking. He suggested that IS strategy be concerned
with the organization’s required information systems or application set,
in essence addressing the ‘what’ question; and the IT strategy be con-
cerned with the technology, infrastructure and associated specialist skills,
or the ‘how’ question. This relationship is depicted in Figure 1.6.

What can be concluded is that we should treat IS/IT like any other part
of the business, which—like marketing, production or purchasing, for
example—must be carried out efficiently and effectively for the business
to survive but which can also provide competitive/strategic leverage for
the organization if it is managed astutely. This implies an approach to
developing strategies for information systems and technology that are
derived from and integrated with other components of the strategy of
the business.

If the organization were developing the marketing part of its business
strategy, then it would first analyse its position in the marketplace (i.e.
have a marketing input to the process). After evaluating marketing re-
quirements and options in conjunction with other needs, opportunities
and constraints, a marketing strategy would result that would be aimed at
achieving the appropriate effects in the marketplace. That is all the diagram shows—that we should do the same with IS/IT: identify the potential impact first, then evaluate what information and systems are needed to enable delivery of the strategy and, then, determine how best to achieve those information systems via the technology.

However, an additional complexity is the fact that information permeates all organizational activity and is used by all organizational employees—from senior management to front-line staff to back-room operatives—in the performance of their job. For example, although marketing and production are business functions, they both demand the processing of information from internal activity as well as from customers, suppliers, regulatory authorities, financial institutions, etc. In addition, the internal information network binds the organization together. Whereas organizations tend to plan other resources, little effort is generally devoted to planning the type of information needed, when used, where it is to be collected and stored, how it will be used or who is responsible for it.

This model is perhaps too simple to deal with complex businesses in rapidly-changing environments and, in later chapters, it will be refined and further developed, but it serves as a good starting point to clarify key relationships and issues.

**An Applications Portfolio for the ‘Combined Era’**

The applications in the overall DP, MIS and SIS portfolio need to be planned and managed according to their existing and future contribution
to the business. Traditional portfolio models considered the relationship of systems to each other and the tasks being performed, rather than the relationship with business success. A portfolio model for the combined era can be derived from a matrix concept developed by McFarlan,63 which considered the contribution of IS/IT to the business now and in the future, based on its industry impact. This variation on the matrix is represented in Figure 1.7.

The model proposes an analysis of all existing, planned and potential applications into four categories based on an assessment of the current and future business importance of applications. An application can be defined as strategic, high potential, key operational or support, depending on its current or expected contribution to business success.

The original McFarlan Strategic Grid was devised as a way of plotting the overall expected contribution of IS/IT to the business success. This is of limited value, since every enterprise is likely to have some strategic, some key operational, some support and some high-potential applications. Over time, the contents of the portfolio will change, and, for any organization, the contents of segments of the portfolio will be influenced by a variety of internal and external factors, as described later. The usefulness of this derivative matrix is borne out by the ease with which management is willing to and can categorize applications according to their perceived business contribution and potential. The limitations of the original Strategic Grid are also described by the research of Hirschheim et al.,64 who found, when surveying the views of IS management, that ‘it
was an unhelpful way of categorising (the whole) IS function since virtually every company had systems in all four categories.’

This derivative model has, however, proved effective in providing a framework by which agreement on the portfolio of business applications available and required can be reached from the often divergent views of senior management, functional line managers and the IS/IT professionals. Once that agreement has been reached, the organization can move forward along mutually agreed paths toward delivery of the required portfolio. It is a simple concept, which enables consensus to be achieved both as a strategy is developed and later, as the business and its requirements evolve.

The four quadrants categorize information systems based on their business contribution. While this portfolio will be discussed in detail later in the book, briefly these application categories are:

- **Strategic** applications that are critical to future business success. They create or support change in how the organization conducts its business, with the aim of providing competitive advantage. Note that whether the technology used is ‘leading edge’ does not indicate that the application is strategic—assessment must be based on business contribution.

- **Key operational** applications that sustain the existing business operations, helping to avoid any disadvantage. It can be argued that, in many industries, substantial numbers of applications (e.g. EPOS [electronic point of sale], ATMs [automated teller machines] and ERP) have become so pervasive that they have become ‘mandatory’ for survival in the industry.

- **Support** applications which improve business efficiency and management effectiveness but, in themselves, do not sustain the business or provide any competitive advantage.

- **High potential** innovative applications which *may* create opportunities to gain a future advantage, but are as yet unproven.

The portfolio, as described here, shows some obvious similarities to other portfolio matrices used in other management disciplines, such as the Boston Consulting Group’s ‘Boston Matrix’ for product portfolios. Those similarities, concerning balancing the portfolio, life cycles, management approaches, etc., will be examined in detail in Chapter 7, when the value of the matrix in IS/IT strategic management is explored. At this stage, it is sufficient to point out that the four segments will require quite different strategies to achieve successful planning, development, implementation and operation of the applications—because they fulfil different roles in the business.
WHAT IS AN IS/IT STRATEGY?

We have alluded to the concept of an IS/IT strategy, without actually defining exactly what is meant by the concept. Figure 1.6 provided a glimpse of its fundamental components. Essentially, an IS/IT strategy is composed of two parts: an IS component and an IT component. The IS strategy defines the organization’s requirement or ‘demand’ for information and systems to support the overall strategy of the business. It is firmly grounded in the business, taking into consideration both the competitive impact and alignment requirements of IS/IT. Essentially, it defines and prioritizes the investments required to achieve the ‘ideal’ applications portfolio, the nature of the benefits expected and the changes required to deliver those benefits, within the constraints of resources and systems interdependencies. The specific components of an IS strategy are addressed in Chapter 3. The focus of this book is on presenting an approach for the development of an IS strategy.

The IT strategy is concerned with outlining the vision of how the organization’s demand for information and systems will be supported by technology—essentially, it is concerned with ‘IT supply’. It addresses the provision of IT capabilities and resources (including hardware, software and telecommunications) and services such as IT operations, systems development and user support.

Throughout this book, we will often use the term IS demand to refer to the IS strategy. Similarly, when we use the term IT supply, we are referring to the IT strategy.

Strategic Alignment

There is a difference between having an IS/IT strategy and having an IS/IT strategy that is making a contribution to the creation of business value. In the late 1980s, a number of models were developed to assess the extent of alignment of business strategies and IS/IT strategies.

While the concept of strategic alignment has been in use for many years, the Massachusetts Institute of Technology (MIT) Management in the 1990s research project attached a particular meaning to the concept in the context of IS/IT management. Their interpretation is based on the premise that the inability of organizations to realize value from IS/IT investments is, in part, due to lack of alignment between business and IS/IT strategies. They developed a model that represented the dynamic alignment between the business strategic context and the IT strategic context. This model is based on the building blocks of strategic integration and functional integration. Henderson and Venkatraman argue that the alignment perspective should—at minimum—involves four
domains of strategic choice: business strategy, organizational infrastructure and processes, IT strategy and IT infrastructure and processes (see Figure 1.8). Each domain has its own underlying dimensions. Box 1.3 presents the 12 components of alignment. The strategic alignment model (SAM) assesses the range of strategic choices facing managers and explores how they interrelate.

In an empirical study that explored business and IS/IT strategic alignment in the Australian banking industry, Broadbent and Weill reported that central to alignment is the nature of the firm-wide strategy formulation processes of the banks. They noted that a key factor for the banks in developing a realized IS/IT strategy, consistent with business needs, is a flexible and issue-oriented strategy formulation process, with concurrent processes taking place at different organizational levels. In addition, their data indicated that those banks with the most effective management of IS/IT occurred when those resources were managed by those closest to business needs.

Another conclusion from the application of the alignment model is that management should not simply seek to identify and adopt the best available technologies to restructure the organization or streamline the business processes, without due consideration of the two relevant alignments that have IS/IT strategy as the driver: competitive potential and service level. The former identifies the potential impact of IS/IT on business strategy with consequent implications for organizational infrastructure. The latter seeks to provide the best possible supply of IT resources—the IT strategy.

Luftman has developed a Strategic Alignment Maturity Assessment instrument to assess the maturity of an organization’s strategic
Box 1.3 The 12 components of alignment *(source: J. Luftman, ‘Assessing business-IT alignment maturity’, *Communications of AIS*, Vol. 4, reproduced with permission)*

I. Business strategy
   1. *Business scope*. Includes the markets, products, services, groups of customers/clients and locations where an enterprise competes as well as the competitors and potential competitors that affect the business environment.
   2. *Distinctive competencies*. The critical success factors and core competencies that provide a firm with a potential competitive edge. This includes brand, research, manufacturing and product development, cost and pricing structure, and sales and distribution channels.
   3. *Business governance*. How companies set the relationship between management, stockholders and the board of directors. Also included are how the company is affected by government regulations, and how the firm manages its relationships and alliances with strategic partners.

II. Organizational infrastructure and processes
   1. *Administrative structure*. The way the firm organizes its businesses. Examples include centralization, decentralization, matrix, horizontal, vertical, geographic, federal and functional.
   2. *Processes*. How the firm’s business activities (the work performed by employees) operate or flow. Major issues include value-added activities and process improvement.
   3. *Skills*. HR considerations such as how to hire/fire, motivate, train/educate and culture.

III. IT strategy
   1. *Technology scope*. The important information applications and technologies.
   2. *Systemic competencies*. Those capabilities (e.g. access to information that is important to the creation/achievement of a company’s strategies) that distinguishes the IT services.
   3. *IT governance*. How the authority for resources, risk, conflict resolution and responsibility for IT is shared among business partners, IT management and service providers. Project selection and prioritization issues are included here.
alignment. He rates maturity along five levels, beginning with an ad hoc process rising to Level 5 where there is an optimized alignment process. He notes that achieving alignment is evolutionary and dynamic, requiring strong support from senior management, good working relationships, strong leadership, appropriate prioritization, trust and effective communication, as well as a thorough understanding of the business and technical environments. These aspects will be addressed throughout this book.

Why Have an IS/IT Strategy?

We have been making a strong argument for organizations to have an IS/IT strategy. Although we shall explore in depth how an organization can go about developing this strategy, it is worth highlighting that there is a considerable amount of research and practical evidence illustrating that the consequences of not having an IS/IT strategy are severe. These implications include:

- Systems investments are made that do not support business objectives.
- Loss of control of IS/IT, leading to individuals often striving to achieve incompatible objectives through IS/IT.
- Systems are not integrated. This can also lead to duplication of effort and data leading to inaccuracy and no coherent information resource.
- No means of setting priorities for IS projects/resources and constantly changing plans leading to lower productivity, etc.
- No mechanisms for deciding optimum resource levels or the best means of supplying systems.
- Poor management information; it is either not available, inconsistent, inaccurate or too slow.
Misunderstanding between users and IT specialists leading to conflict and dissatisfaction.

Technology strategy is incoherent and constrains options.

Inadequate infrastructure investments made.

All projects evaluated on financial basis only.

Problems caused by IS/IT investments can become a source of conflict between parts of the organization.

Localized justification of investments can produce benefits that are actually counterproductive in the overall business context.

Systems, on average, have a shorter than expected business life and require, overall, considerably greater IS/IT spending to redevelop more frequently than should be necessary.

THE CONTEXT FOR IS/IT STRATEGY

Before embarking on developing an IS strategy, it is important to understand the context within which this strategy is being developed. This context is likely to be different in different organizations. In this section, two perspectives are presented. The first is largely an internal perspective focusing on the role of IS/IT in the organization. The second is an external perspective exploring the overall dynamics of IS/IT.

The Internal Context

Sullivan\(^7\) has suggested a simple matrix to explain how the IS/IT strategic environment is being affected by forces outside the control of any individual organization. He describes two axes within which an organization can consider the implications of these forces:

- **infusion**—the degree to which an organization becomes dependent on IS/IT to carry out its core operations and manage the business;
- **diffusion**—the degree to which IT has become dispersed throughout the organization and decisions concerning its use are devolved.

These axes not only reflect the increasingly strategic nature of IS/IT but also the changing economics of the technology and the ability to use it without the need for highly-skilled technical staff. Sullivan’s framework is shown in Figure 1.9. By plotting high and low degrees of infusion and diffusion, four essentially different environments are established. Considering each one in turn:

- **Low diffusion/low infusion**—highly-centralized control of IT resources, and IS is not critical to the business. This, Sullivan describes
as a ‘traditional’ environment typical of companies using IT solely to improve efficiency on a system-by-system basis.

- **Low diffusion/high infusion**—highly-centralized control, and IS is critical to business operations and control. The business could be seriously disadvantaged if systems fail. Therefore, high-quality systems are needed with, normally, a high degree of integration. The systems have become part of the ‘backbone’ of the organization, in Sullivan’s terms.

- **High diffusion/low infusion**—largely-decentralized control, giving business managers the ability to satisfy their local priorities. Any integration of systems occurs due to user–user cooperation (a ‘federation’ of interests), not by overall business or IT design. The management approach is essentially ‘opportunistic’, driven by short-term priorities that may create business advantage in some areas.

- **High diffusion/high infusion**—largely-decentralized control but the business depends on the systems for success, both in avoiding dis-
advantage and in achieving its overall business objectives. Sullivan describes this as a ‘complex’ environment that is difficult to manage. Too much central control to avoid poor investments will limit innovation, hence new strategic opportunities may be missed; too little control and the core systems may disintegrate.

As organizations evolved through the DP and MIS eras, they tended to move from the low–low quadrant into one or other of the high–low quadrants. This often depended on the timing of their particular evolution and the availability of centralized (mainframe) or decentralized (distributed or PC) technology solutions to the DP and MIS needs. The arrival of the SIS era forced organizations to enter the high–high quadrant, and, depending on the direction taken in the previous eras, the changes to be made will be different. In both cases, however, senior business management will need to make some key decisions about IS/IT in concert, rather than allow local business managers total discretion or the IT department to control the types of investment.

The overall implications are that, as the organization becomes more dependent on IS/IT, essentially to avoid being disadvantaged, the more centralized and structured the approach to planning and control should become. But, to facilitate the innovative uses of IS/IT to create future advantages, technology control needs to be close to the business user to enable appropriate connections between business need and technology solution to be made. Gaining advantage and avoiding disadvantage implies both high diffusion and high infusion, and, hence, a complex, balanced set of management approaches (described by Sullivan as ‘eclectic’). Most organizations are facing this situation, and both internal and external pressures will increase, as indicated in Figure 1.9. Probably the best interpretation of the word ‘eclectic’ is to say that every organization needs approaches to IS/IT strategy formulation and planning tailored to its individual circumstances, as determined by the industry and business situation and the organization culture.

The External Context

The dynamics of IT and, hence, the consequences for both business and IS/IT strategy development, are complex. Figure 1.10, however, attempts to shed light on this complexity and capture these dynamics. The Figure first illustrates the duality of technology in that it not only supports the strategy of an organization (arrow \(a\)—strategic alignment) but can also define the business, as strategic moves may not be possible without technology (arrow \(b\)—competitive impact). For example, organizations such as eBay, eSteel and Covisint all deploy business models that are
fundamentally defined by technology. Technology also facilitates new ways of organizing, new process innovations and can enable the creation of innovative ‘network-based businesses’. The Lotus Development Corporation, for example, have a development strategy that ‘follows the sun’, where a virtual team work 24 hours a day on a project: the day begins in Dublin, eight hours later the work is handed over to Los Angeles and after a further eight hours the work is moved to Singapore, eventually returning back to Dublin 24 hours after it first began. This way of organizing work is critically dependent on technology.

However, an organization does not exist in isolation (unless it occupies a monopoly position), but has competitors and is part of a wider industry system and business environment. Competitors’ moves, including new entrants, affect the dynamics of an industry and, consequently, the organization itself and its strategies (arrow c); at the same time, strategic plays made by the organization effect competitor moves (arrow d). Technological innovations can have disruptive effects on an industry (arrow e), rewriting the rules of competition and even challenging traditional notions of industry structure. For example, many retailers and utilities have entered the financial services industry as they argue that they know more about the customers of banks than the banks know about their own customers. Consequently, we may define an industry
not by the Standard Industrial Classification (SIC) code, as has traditionally been the case, but by the amount of customer information an organization has.\textsuperscript{71}

While this dynamic is driven by new technological innovations, it is less of a technology revolution than a revolution in the economics of information and how information is captured, processed, stored, planned and used in an organization. This point has been eloquently made by Microsoft founder Bill Gates who noted, ‘I have a simple but strong belief. The most meaningful way to differentiate your company from your competition, the best way to put distance between you and the crowd, is to do an outstanding job with information. \textit{How you gather, manage, and use information will determine whether you win or lose.}\textsuperscript{72}

It is within this context that management must determine how the organization can best utilize technology to leverage information discontinuities, asymmetries and imperfections for business advantage.\textsuperscript{73} For example, recent research has presented evidence suggesting that the control, dissemination and manipulation of CRS information by the owning airlines continued to allow them, despite legislative restrictions, to capitalize on their investment at the expense of competitors during the 1990s.\textsuperscript{74}

\textbf{TOWARD A FOURTH ERA: AN ORGANIZATIONAL IS CAPABILITY}

Both the IS research literature pre-1990 and media reports reflected a general optimism concerning IS/IT’s potential for creating advantage. More recently, there has been interest in exploring the essence of ‘sustainability’ from IS, as few organizations continuously achieve advantage from their IS/IT investments and the exemplars often quoted tend to be from different organizations. Although organizations may gain some ‘first mover advantage’ with an innovative application, it can be quickly copied and does not produce an advantage that is sustainable,\textsuperscript{75} particularly when patent protection for IS applications is almost non-existent and where keeping an IS innovation secret is difficult, especially for systems used by customers or suppliers. Indeed, there is a strong argument that the use of standard applications packages such as those developed by vendors (e.g. SAP, BaaN or JD Edwards), a common strategy today, can limit an organization’s ability to innovate.\textsuperscript{76} At the same time, investments made in technology infrastructure are becoming increasingly significant and inappropriate decisions in this area can severely affect an organization’s ability to respond swiftly and flexibly
to changing market conditions and can, in fact, become a significant competitive liability.77

The strategic management discipline has long sought to elicit the sources of sustainable competitive advantage78 and there is a significant body of research that has focused on this objective, some of which will be discussed in the next chapter. Yet, what is often not made obvious when reading this literature is that a clear distinction between sustainability and competitive advantage must be drawn. Competitive advantage is an outcome; sustainability is an ongoing state existing ‘after efforts to duplicate that advantage have ceased’.79 As an outcome, a particular competitive advantage may be short-lived, and is increasingly likely to be so in today’s technological world. When competitive advantage is enduring,80 it is not that a particular outcome is enduring, but that there is ‘something’ in the very fabric of the organization contributing toward creating ongoing and continuous advantage.

Sustainability, from an IS perspective, can be defined as an organization’s ability to continually deliver explicit business value through IS/IT, thus leading to advantage. The challenge that both practitioners and researchers face today is to understand what contributes toward the development of this sustainability. Some insights have been provided by recent research literature. Box 1.4 highlights some relevant extracts from these studies. Box 1.5 describes how Bankinter, a mid-sized Spanish Bank, has deployed IS/IT over the years to achieve continuous advantage through combining innovative business thinking with IT-based opportunities and an ability to deliver new applications and business changes.

In an analysis of some of the early examples of IS/IT and competitive advantage, Kettinger and colleagues81 concluded that the attainment of sustained IS/IT-based competitive advantage may be more a process of building organizational infrastructure in order to enable what they referred to as ‘innovative action strategies’. More recently, Powell and Dent-Micallfer82 investigated the linkages between IT and the performance of firms in the retail industry, asserting that ‘IT alone is not enough’. From their study, they concluded that some firms have gained advantage by using IT to leverage intangibles, complementary human and business resources such as organizational flexibility, integrating business-strategy planning and IS/IT strategy, and supplier relationships.

In a conceptual analysis of IS/IT and competitive advantage, Mata et al.83 concluded that only IS management skills are likely to be a source of sustained advantage. They described these skills as the ability of IS managers to understand and appreciate business needs, their ability to work with functional managers, their ability to coordinate IS activities in ways that support other functional managers and their ability to anticipate future needs. They suggest that, in the search for IS/IT-based...
Box 1.4 Extracts of findings from recent research studies on IT and competitive advantage (listed in chronological order).

- When every leading firm in an industry has access to the same technology resource, the management difference determines competitive advantage or disadvantage (Keen, 1993).
- The attainment of sustained IT-based competitive advantage may be more a process of building organisational infrastructure in order to enable innovative action strategies as opposed to ‘being first on the scene’ (Kettinger et al., 1994).
- Successful application of IT are often due more to serendipity rather than any formal planning (Ciborra, 1994).
- Only IT management skills are likely to be a source of sustainable competitive advantage (SCA) (Mata et al., 1995).
- Some firms have gained advantage by using IT to leverage intangibles, complementary human and business resources, such as flexible culture, strategic planning–IT integration, and supplier relationships (Powell and Dent-Micallef, 1997).
- What distinguishes companies deriving significant value from IT is not technical wizardry but the way they handle their IT activities (Dvorak et al., 1997).
- Companies must do more than excel at investing in and deploying IT. They must combine those capabilities with excellence in collecting, organising and maintaining information, and with getting their people to embrace the right behaviours and values for working with information (Marchand et al., 2000).
- Results from this study … suggest that inconsistent statistical findings about the relationship between IT and firm performance may be attributed to our incomplete understanding of the nature of a firm’s resources and skills and to the fact that IT investment dollar serves as a poor surrogate for assessing a firm’s IT intensiveness. IT-capability is not so much a specific set of sophisticated technological functionalities as it is an enterprise-wide capability to leverage technology to differentiate from competition (Bharadwaj, 2000).


Box 1.5  Evolution of IS/IT leadership at Bankinter

Although the Spanish banking system ranks as one of the most efficient in the world, Spain is not a technologically-advanced country; Internet penetration is low and the telecommunication system still lags behind its European counterparts. Yet, it is in this environment that Bankinter, a medium-sized bank, has flourished as one of the best Internet banks in Europe. In 2000, Euromoney ranked Bankinter, as ‘Best European Internet Bank’. Similarly, Salomon Smith Barney included Bankinter as one of the leading Internet banks, ready to take advantages of the opportunities that the Internet offered.

Bankinter was founded in 1965 as a wholesale bank, a joint venture between Bank of America and Banco Santander. Supported by sophisticated information systems and a flexible commercial approach, it has entered into a series of new businesses, thereby changing the bank’s business profile throughout the years for middle-market banking to private banking and finally to retail banking. It has been a pioneer in the Spanish banking market in offering competitive conditions to customers not only in terms of price but also in terms of speed, quality and flexibility of services. The bank has one of the most sophisticated customer bases. It addresses the high end of the retail market by attracting
financially-sophisticated clients wishing to receive a different customer service and a more intelligent product offering.

Bankinter is the most developed example of a multi-channel bank in Spain, and possibly in Europe, operating through the following channels:

- branches located in urban areas across Spain;
- virtual branches located in large corporations;
- telephone banking;
- a network of independent agents;
- Internet.

The changing distribution of transactions by channel since 1995 is clearly visible in the table below:

<table>
<thead>
<tr>
<th>Distribution by channel (%)</th>
<th>1995</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branches</td>
<td>69</td>
<td>39</td>
</tr>
<tr>
<td>Electronic banking</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Telephone banking</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Internet</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Cards</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

(Source: Annual Report, 2000)

Bankinter has always maintained a high level of investments in technology. Nonetheless, in 2000, as a result of its strategic focus on Internet-enabling the entire bank, Bankinter made significant additional investments in this area (24% of total operating cost). The objective of this focus was to migrate all banking products and services to the Internet. According to the Chairman, ‘2000 was … a transition from the traditional banking model to a new multi-channel structure focused on customer service quality and on the great opportunities opened by the new technologies to the banking business … an enormous transformation effort at the bank to consolidate … our leadership in Internet banking in Spain and Europe’ (Jaime Botin, Chairman of the Bank, Chairman’s letter, Annual Report, 2000).

Bankinter’s main competitive strengths are its light and flexible operating structure, superior information and technology systems, and proven ability to adapt to changing market conditions by offering new banking services. It has illustrated how it is possible to compete with limited resources through innovation, intelligent marketing and superior customer service.

Bankinter has always invested heavily in technology—10% of operating costs during the 1990s. These investments, significantly
sources of sustainable advantage, organizations must focus less on IT, *per se*, and more on the process of organizing and managing IT. Further support for this position is provided by Dvorak *et al.*\(^8^4\) who concluded that what distinguishes organizations with high-performance IT is not technical wizardry but the way they manage their IS/IT activities. Keen\(^8^5\) noted that the ‘wide difference in competitive organisational and economic benefits that companies gain from this information technology rests in a management difference and not a technical difference. Some business leaders are somehow able to fit the pieces together better than others.’ Ross *et al.*\(^8^6\) and Bharadwaj\(^8^7\) have argued that, for an organization to apply IT to enhance competitiveness, it must develop an effective ‘IS capability’.

higher than its competitors, have allowed the bank to become the market benchmark in innovation and technology. The implementation of a multi-channel approach has also relied heavily on technology. As CEO Juan Arena repeatedly states, ‘This [Bankinter] is not a bank. This is a technology company that happened to do banking.’

With its objective of achieving technology leadership, the following initiatives show how it doggedly approaches this objective:

- Launched first full service telephone-banking operations in 1992, rated as the best and most successful operating model in Spain.
- Opened its Internet-free access service to customers in 1996—its ISP is ranked seventh in Spain with 180,000 customers. This movement revolutionized the ISP market in Spain from a monthly-fee business model to a free-access business model.
- Launched the first Spanish online broker in 1997. Currently, more than 95% of securities transactions pass through this service.
- Full range of online banking completed in 1999. The first bank to support a full online mortgage offering, achieving a market share of 6%.
- Between 1999 and 2000, it created an Internet-enabled organization and migrated all products and services to the Internet.
- Opened virtual branches in the most visited portals and financial portals in 2000 (Lycos Spain and Invertia.com).

Through a combination of innovative business thinking and an IS capability, Bankinter has managed to pave the way in Spanish banking and consistently holds an advantage over its rivals.
However, to date, no one has clearly defined ‘IS capability’ beyond an expression of its core objective of enabling an organization continuously to derive and leverage value through IS/IT. This presents a serious challenge for organizations who seek to understand and develop an ongoing IS capability, as there is little guidance about how organizational resources contribute toward both its development and deployment. Remember that Dell, Cisco, Bankinter, Amazon.com and the many other companies mentioned in this chapter have gained advantage by using technologies that are non-proprietary and widely available to all. In the final chapter, this concept of IS capability is further explored and developed, and we suggest that it does represent the emergence of a new era.

**SUMMARY**

The evolution of information systems and technology in a business and organizational context has been erratic, but, without doubt, IS/IT has inexorably increased its importance as the economics and capability have enabled more to be achieved. Increasingly, competitive business environments have provided a motivation to invest in more efficient and effective ways of carrying out business processes and managing the business. Although the progress has been fitful and unsynchronized, patterns can be observed.

The two major ‘eras’ of DP and MIS are well established and much can be learnt from them—in particular, that the best ways of planning for applications, given the contribution they can make to the business, were only discovered well into the eras, from painful experience in many cases. Often the secret of better IS/IT planning was only discovered after initial enthusiasm had turned to frustration—just before disillusion was about to occur; necessity perhaps being the mother of invention of better approaches!

We are now well into the third era, with bigger prizes and, reciprocally, greater risks, when the business can become critically dependent on its investment in systems not just for its success but for its very survival—planning for information systems has become strategic for many companies. That does not mean that previously-developed, good IS/IT strategy formulation and planning practice is obsolete, merely inadequate for the new era. Can companies afford to wait to find the appropriate strategy approaches until the enthusiasm has faded into frustration? It may then be too late. The SIS era implies winners and losers with IS/IT, not just relative success and failure, which may not reflect directly in the overall business performance.
In this new millennium, increasing business pressures and the improving capabilities and price/performance of IT have led to the consideration of more radical strategies than previously. These can require the transformation of business processes, organizational structures and relationships to achieve major improvements in business performance. Clearly, changes to the organization’s information systems will be an integral component of this ‘industry re-engineering’—in creating and implementing the new processes and enabling new organization structures to function. But, also, innovations in the use of information and new technologies are essential ingredients in creating the options for change. Hence, strategies for IS will have to be more radical and more adaptable in the future than they have been in the past.

The last obvious conclusion about the evolution of strategic planning for IS/IT is that it is now clearly a process that depends on users and senior management involvement for success. It has become difficult to separate aspects of IS/IT strategy from business strategy. Hence, it is important to use the tools and techniques of business strategic analysis and planning to ensure that approaches to IS/IT strategy formulation and planning are knitted into the pattern of business strategic management. Indeed, the emerging fourth era seeks to embed an IS capability in the very fabric of the organization. Chapter 2 starts this integration process by considering the processes and tools of business strategic management.

ENDNOTES

4. Orlikowski and Iacono have questioned whether we have now gone too far by not devoting enough attention to the artefact of technology. See W.J. Orlikowski and C.S. Iacono, ‘Research commentary: Desperately seeking the “IT” in IT research—a call to theorizing the IT artefact’, Information Systems Research, Vol. 12, No. 2, 2001, 121–134.
9. Both incumbents and new entrants have learnt expensive lessons in their Net forays. See, for example, A. Edgecliffe-Johnson, ‘A billion-dollar mistake’, Financial Times, 10 July 2001; J. Willman, ‘Merrill to scale back online role’, Financial Times, 7 December 2001;


39. While Office Automation was a popular concept in the early 1980s, due primarily to the arrival of the PC, in fact researchers were writing about OA back in the 1960s. See, for example, D.R. Hoos, ‘The impact of office automation on workers’, International Labour Review, Vol. 32, No. 4, 1960, 363–388; and D.R. Hoos, ‘When the computer takes over the office’, Harvard Business Review, November–December 1960, 102–112.
55. N. Venkatraman, ‘IT induced business re-configuration’, in M.S. Scott Morton, ed., The


78. Hamel and Heene have written that ‘[s]ustaining a profitable existence and thus creating welfare and reduced poverty in society is the basic mission of any company. Academics (as well as consultants) should develop concepts, techniques, approaches and frameworks to assist business people in fulfilling this basic mission. Based on this general mission, a theory of strategic management should primarily focus on the dynamics of “sustainable competitive advantage” as one of the most prominent driving forces for long-term profitability and survival’ (p. 315). See G. Hamel and A. Heene, eds, *Competition-Based Competition*, John Wiley & Sons, Chichester, UK, 1994.

79. Barney writes that an organization is said to ‘have a competitive advantage when it implements a value creating strategy not simultaneously being implemented by any current or potential competitors’ (p. 102). See J.B. Barney, ‘Firm resources and sustained competitive advantage’, *Journal of Management*, Vol. 17, 1991, 99–120.

80. Barney notes that it is not the ‘period of calendar time that defines the existence of a sustained competitive advantage, but the inability of current and potential competitors to duplicate that strategy that makes a competitive advantage sustained’ (p. 103). See J.B. Barney ‘Firm resources and sustained competitive advantage’, *Journal of Management*, Vol. 17, 1991, 99–120.


