The Information Management Body of Knowledge

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"IMBOK"

Collected and edited by
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Preface

This text is offered primarily as a reference source for postgraduate students who are concerned with the way that information works for organisations. Although there are good books available, none cover the ground in the way that is done here. This is intended to be a reference source that students can use as they work to research the many issues that we do not yet fully understand, and for others who are striving to manage information more effectively in their professional activities.

This is because many professional people (from all disciplines) have come to understand the importance of information in their work. Lawyers, teachers, journalists, logisticians: all are dependent on information for professional success and some choose to undertake part-time postgraduate studies in order to understand more about this. But the breadth of issues associated with information management practice is vast, extending from an understanding of the base technologies that are used, right through to questions of business strategy and how it can accommodate the potential benefits of information technology.

The central problem today for many people is the wide scope of the issues that need to be understood. Turning an investment in new information technology and information systems into improved business performance proves to be a tortuously difficult thing, and for many years initiatives of one kind or another have failed to assure success. This text gives an easily understood framework that relates business needs to new information technology opportunities in a relatively simple, staged way.

The framework presented here, known as the "Information Management Body of Knowledge" or just "IMBOK", allows us to locate problems and opportunities and to move our ideas more easily from one domain to another – from consideration of raw technologies through to issues of business practice and business strategy. It also provides us a means to organise the literature about the subject and it is hoped that the fruits of present and future research will accumulate within and around the IMBOK framework. Using it, it is hoped that future students, professionals and managers will have easier access to the diverse tools and techniques that they need; further, researchers will have the means to position their research ideas and to share them with others, more effectively than would otherwise have been possible.

In this way, this text is intended to provide a reference for those who are concerned to bridge any actual or perceived divides between information technology "specialists" and business "generalists"[1]. So, this text should be useful for …

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[1] The use of quotation marks here is advisable, because we must be careful not to label everyone in IT as a "specialist" and everyone in business as a "generalist" – this would be inappropriate in many cases. However, perceptions are sometimes more important that reality and we shall start with the presumption that people on the one side see the people on the other as different, in some markedly difficult way.

- Researchers who are anxious to position their work in a context of some kind, where that work is in some way IT-related even if distantly.
- Students who are looking for a simple contextual framework within which to organise their ideas, when all that they are hearing and reading becomes too complex to understand easily.
- Managers who wish to choose appropriate management tools to ease the difficulty in marrying strategy and strategic implementation to the many opportunities and problems presented by technology.

Of course, organising the issues in such a simplistic way might be misleading. Real life is not simple, and the tendency – evident for many years now – of "IT people" to try and reduce complexity by reduction, masks some of the unexpected connections that might exist outside the simple view that is presented. For example, if in an organisation the chief executive office decides that it is necessary to introduce workflow systems, and to eliminate all paperwork, then there can be no doubt that the workforce at all levels will set about exactly that, whatever their misgivings. What readers of this text might find is that there is too little attention to the soft issues: the attitudes that people adopt, the cultural factors that colour everything that goes on in a business, and the relationships between people that so often override pure logic.

In a recent conversation with Professor Chris Edwards at the Cranfield School of Management in the UK (where some of the ideas presented here originated), he remarked that the issue of the moment is indeed culture: if an organisation has no cultural bias to embrace and adopt change, then investments related to change are doomed to difficulty, or even outright failure. However, if we are to avoid hopeless complexity we can only adopt one perspective at a time and the view presented here is relentlessly reductionist. It may be the product of a "left-brained" mind, but at least it gives us a comprehensible framework around which to debate our problems and to begin to organise the balance of our difficulties, however soft, people-related or cultural they may be.

Acknowledgements

Edwards, John Ward, Joe Peppard and Rob Lambert, and the many others who have worked with this group over the years. It is through their efforts that these ideas have emerged and prevailed, and it is hoped that this presentation of them, within a more ordered framework of management thinking than has been available before and in conjunction with other relevant ideas, will help the wider community to understand, adopt and enjoy working with this new "toolkit".

Finally, I must thank those closer to me: my wife Ann for undertaking constructive criticism and proofreading, and the research team at UWC and Cape Technikon (see below).

Having said that, any residual errors or omissions may be laid at my door, and I look forward to receiving comments and suggestions that will improve this work.

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Thanks, everyone!

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Introduction

A journey with no map?

This text maps out a single "journey". We can take the journey in two different directions. In one direction it starts with an investment in information technology and works towards improving business performance. In the other direction, it starts with the formulation and implementation of an organisational strategy that strives to make the best possible use of information technology.
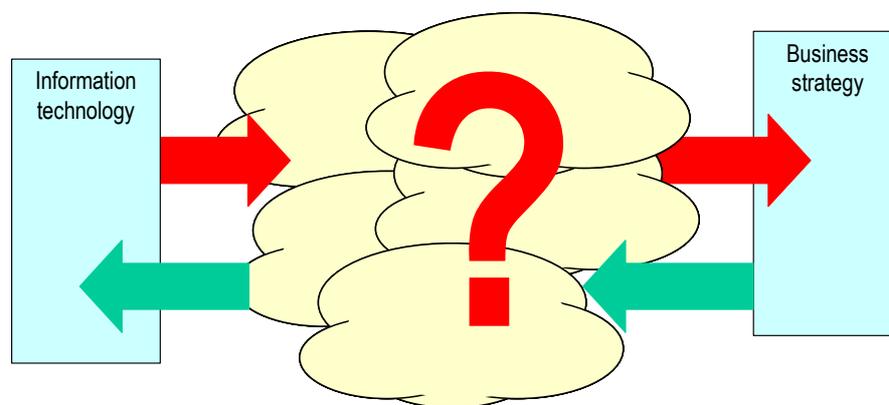
A difficult journey?

It's your choice: typically (and quite naturally), people with their noses into information technology would choose to spend the money and then explore the possibilities; people more concerned with the business would set their targets and then look to see whether the technology might contribute to their attainment.

The critical question is: *What sits between these two extremes*?

Success is difficult to find

Some IT project managers, firmly entrenched in the world of information technology, will say *"Yes, my project was a success"*, based solely on the argument that their project came in "on time" and "within budget" (although the evidence is that fewer than 50% of IT projects actually manage to do so). But talk to their "users", the people who are expected to *use* the system that has been delivered to deliver strategic intentions, and you may well find a different story. *"This is not what we needed"*; *"If they had only come to talk to me I could have sorted this out myself"*; *"Putting in this system has cost us eight month's production – we would have been better off without it"*; *"They put this system in with no support at all – I have no idea how I should be using it"*; these all might be typical comments in the difficult weeks and months following the introduction of a new system.

So, what is going wrong?   It's difficult to say. For more than 40 years experts have been trying to find the answer to this question, and even today we have no complete solution. Of course, there are cases of success with IT, but there are at least as many cases of failure.

Finding our way

Spending money on technology is easy. Developing a business strategy – even one that takes full account of information technology opportunities – is also relatively easy. The problem lies in the space between these two, in the uncertain world of project management, systems implementation, business change management, benefits delivery, and performance management.

It is clear that the successful deployment of information technology demands many differing competencies and capabilities. Experience suggests that in larger organisations it is possible to employ specialists who sit in the middle of this spectrum of activity, and specialise in working between the extremes. Where once we relied upon the systems analyst to gather requirements and specify solutions, as the scope of our ambitions has extended well beyond the simple systems of the 1970s and 1980s we need *business* analysts, not systems analysts. The tools and techniques that these business analysts use are different. They are not just concerned with analysing business activities and designing database structures, they are concerned sometimes with wholesale business change – a different thing altogether.

New competencies are needed

The world of business has invested large sums of money in trying to address the "middle ground", but often in a piece-meal manner. Just "doing" project management does not solve the problem.   Single role players – the project manager or the business manager, for example – cannot do the whole job by themselves. All role players must combine their efforts in this difficult territory if we are to truly improve business performance through the deployment of new and effective information systems.

The approach taken here is that we must understand the competencies that deliver organisational strategy with appropriate information technology[2]. There are at least five areas of requisite competency, as we shall see; even more important, there is the challenge of moving our thinking from one of these areas to another. That is the most difficult thing of all.

Read any professional computing magazine, talk to any IT consultant (or look at any advanced student dissertation concerning the use of information technology) and you will probably find evidence of the problems that we face

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[2] This is not a new idea. John Zachman published a rather complex version of this idea in 1985 (at the time he was with IBM), and in the 1990s new senior management at BP Exploration introduced "Jacob's ladder", a much simpler version of the same thing – see Zachman (1987), Earl (1995) and Bytheway (2003).

in delivering real organisational benefits from IT-related investments. It seems that this is a problem that will simply not go away.

Two factors to consider: communications and management

Perhaps we should focus more on understanding how success is achieved, rather than studying failures? Anyone reading this who is undertaking a research project might well consider this approach, but at the heart of the problem there are probably two key factors.

When we consider the great diversity of skills that are needed to acquire and deploy information technology it becomes apparent that one person will rarely (if ever) have all those skills at one time. We are all therefore dependent on others for some aspects of the information technology and information systems that we need, and the frustration can be intolerable when communication between different parties becomes difficult and when managers seem unable to deal with the problems that arise. These two issues – *communications* and *management* – are the turning points of our concerns.

- **Communications**: the different people involved in working with IT have different vocabularies and different cultural backgrounds, and find communications difficult.

- **Management**: managers still do not have the tools they need to successfully deal with IT-related problems.

Here we offer a framework that organises the links between IT (as a cost driver) and business strategy (as a fulfilment of objectives) and thereby simplifies problems of communication. It also shows how different management tools can be applied to increase our understanding of the issues, and to improve the probability of success.

A brief history of failure

The early days

For more than forty years organisations have been developing computer-based information systems. Before this people, paper, pens, calculators and mechanical punch card machines were the main tools available for information management. Early applications of computers were those that were the easiest to identify, such as accounting, invoicing, and other labour-intensive office activities involving numbers and calculations.

Although in the very early days simply making computers work was deemed to be a success, problems did emerge with alarming frequency. Partly this was as a result of mismanaged expectations but also as a result of increasing confidence and an increasing ambition to use computers in more and more adventurous ways. The cost of mainframe computers was very high, and the early management focus was on *cost saving* and *efficiency enhancements*. It was different in the middle 1980s, when commercial organisations began to

win *strategic advantage* from innovative applications of information technologies. The window of advantage (the period of time it takes for competitors to catch up and match the strategic advantage) became the critical issue to manage well. This window became shorter and shorter – only months not years – until the capability to manage *change* became the most important thing.

The maturing years

In the intervening years organisations have struggled to deliver systems that really match needs; they have struggled to understand how to set timeframes and budgets that can reliably be met; they have struggled to manage an IT workforce with scarce skills and an alarming tendency to move quickly from one job to another.

In order to improve things, organisations have tried a number of approaches, something along the following lines:

- Hire better programmers, and systems analysts (*early 1970s?*)
- Devise more structured methods of working (*late 1970s?*)
- Introduce project management, like in construction (*early 1980s?*)
- Impose quality management (*later 1980s?*)
- Drive incorporate IT in business strategy (*late 1980s, 1990s*)
- Re-organise the resourcing of IT through "outsourcing" (*1990s*)

These steps have allowed some improvement in the delivery of new systems but there still seems to be a fundamental difficulty with the chasm that exists between the world of IT specialists and the business people who simply want to improve their business operations. Managers on either side have difficulty communicating. Responsibilities on the one side and the other are difficult to define. There is a culture to "throw things over the wall", admitting that these two worlds will never meet.

Supply and demand unraveled

The vast majority of the issues in the early years were those associated with how to 'supply' information systems to business. Information technology was a driver of cost rather than of new thinking and supply-side organisations (such as the mainframe suppliers and the emerging software industry) drove a lot of the early investment through simple marketing and peer pressure. As the supply-side issues became better understood by buyers, and with many basic functions having been automated, attention has turned to more imaginative and fruitful applications of information technology.

Managing demand

This shift of attention has highlighted issues relating to managing the 'demand' for information systems in organisations. No longer are organisations content to be driven by information technology opportunities, now they are searching

for new *business* opportunities. There has been a huge surge of interest in management tools and techniques that help to incorporate information technology into the formulation of business strategy, so that investment is based on real business needs rather than spurious technology-driven thinking. This focus on demand management has not detracted from issues of supply, but rather has broadened the range of matters to be considered by management teams. The focus of the late 1980s was upon the use information systems to gain competitive advantage, or at least to avoid being disadvantaged. As we moved to the late 1990s the window of advantage became narrower and some experts are now arguing that information technology has become commoditised and is no longer strategic. The ability to manage change has become all-important. The available examples of strategic success derived from new technologies, especially web technologies, must be studied so that the capability to deploy technology successfully becomes evident and ideas can be conveyed to those who need them.

Managing supply

Supply issues are still very much the province of information technology managers and specialists – often the people who have grown up with technology during the 1970s and 1980s. Compare the typical "IT" person with someone "in the business" who has an intimate knowledge of business processes and the ability to reveal opportunities at that level. The management of demand is still difficult but we have learnt that functional specialists well versed in the business are best able to decide what the organisation needs in terms of information systems. The prevailing conclusion is that there is still a chasm of some kind between the average "IT" person and "business" person, and that must be the focus of our attention. It must be bridged. We must make that journey, whether from the one end (information technology) or the other (business strategy).

Here we introduce some important ideas that help to bridge the chasm of thinking, essentially by focusing on communications between different role players and on the need for a continuum of management from one end of the journey to the other, which ever way we choose to travel.

The world of business and the world of IT

Speaking at BITWorld '99, an international conference in Cape Town, Allen Lee explored the two worlds of information technology and society at large (Lee, 1999). The figure illustrates how, in his view, these two worlds intersect in a way that makes clear the joint area that is so difficult (but so important) to manage. Rather than a chasm, he suggests that there is an area of common concern that we must understand and work with so as to make sure that information technology makes a good and proper contribution to society at large and business in particular.

*This is the area
that is difficult
to manage*

The world of
information
technology

Society, and
the world of
business

*Focused
Innovative
Fast paced*

*Broad
Status quo
Slow to change*
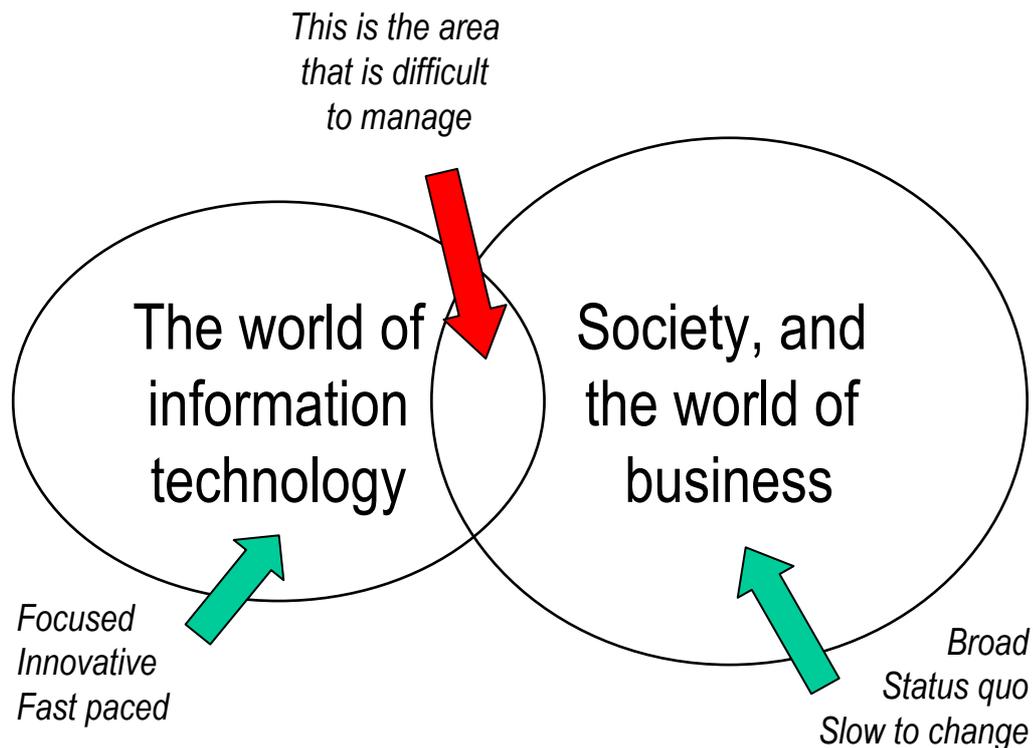
Two worlds, two cultures
(Based on Lee, 1999)

It is interesting to remind ourselves that business is just one aspect of society at large. This is especially so when information technology is so clearly spilling out over the boundaries of organised business and is becoming a commonplace feature of everybody's lives. As we shall see, it is not only organised business that needs to manage information technology well. Those of us who are fortunate enough to have information technology at home, or even in our pockets, need to have some regard for the way that it will enhance and not undermine the quality of our lives.

Those of us who are *not* yet fortunate enough to have information technology within reach must hope that it is used to improve our prospects, although this is one of the more recent and most challenging questions that we face at this time: How can we ensure that the social appropriation of technology (whether by government policy or through the efforts of NGOs and others) is managed in an effective way. Early experiences suggest that there are many more challenges here than we ever anticipated.

The world of information technology is fast paced and very often presumes the advantages of innovation; it is focused on the endless reduction in size of technological devices and the increasing speed and capacity. The world of business increasingly sees information technology as a burden and a cost, which has to be contained. The way to resolve this difference in attitude is to understand the intersection of the two worlds, as Allen Lee has urged us to do.

The Information Management Body of Knowledge

This section introduces the Information Management Body of Knowledge at the level of the **knowledge areas** and the **processes** that comprise its detail.

First the knowledge areas and processes are introduced, and then they are examined in detail in order to show how management tools and techniques can be fitted to this way of thinking, and in order to understand more clearly:

- What it is that we must understand
- How we can move our thinking from one level of concern to another

This dual aim serves the overall intention of the IMBOK, to assist *communication* and to organise more effectively our approach to *information management.* A more detailed discussion follows this introductory section.

The Information Management Body of Knowledge

Allen Lee's simple model masks huge complexities in the junction of information technology and society. The gap (a chasm, even) between the people sitting on either side is well documented and comprises different attitudes, different vocabularies and different expectations. However, the reality is that there *are* connections between these two worlds and it is necessary to understand them if our investments in information technology and information systems are to succeed. We will develop an understanding of those connections here by dividing the intervening territory into five "management" segments – five areas of interest that require distinctly different management skills, competencies and techniques:

- Information technology
- Information systems
- Business processes
- Business benefits
- Business strategy

**The Information Management
Body of Knowledge**

Technology

Information
technology

Information
system

Business
process

Business
benefit

Business
strategy

The area of shared interest

Society
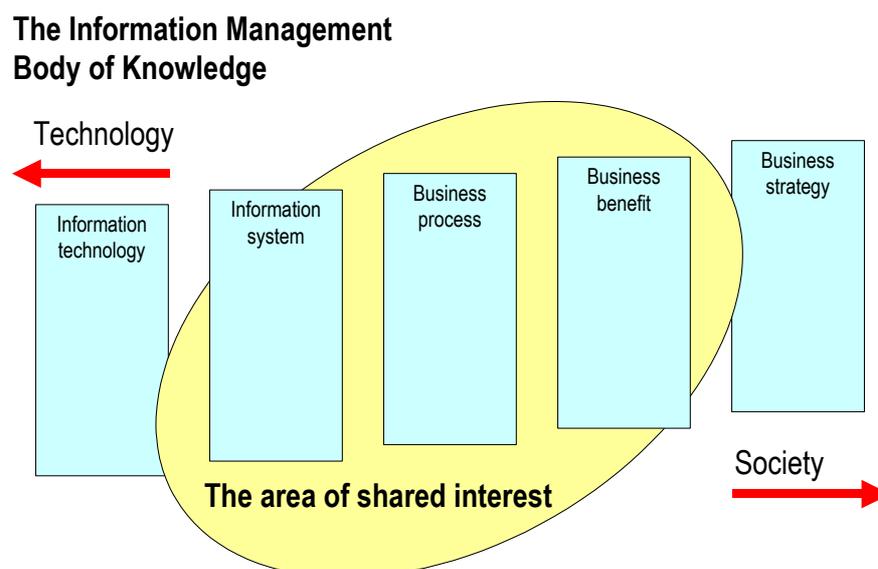
The figure shows **information technology** at the left and **business strategy** at the right, thereby reflecting the arrangement of ideas in Allen Lee's model. We shall attempt to bridge the chasm between the two using three specific, additional areas, that are of concern to *both* parties: the **information system** that makes information technology useful and workable, the **business process** that is improved by the introduction of new information systems, and the **business benefits** that evidence that business process

improvement. Business benefits are usually articulated as performance targets embedded in a strategic plan, and hence we see for the first time the logic that links the two ends of our intended journey.

"**Information Management**" is a phrase we will use here to encompass everything that has anything to do with information in business – in effect the five areas of interest that are shown in the figure and enumerated in the paragraph above. Each of these five will be examined in some detail in the sections that follow. The combination of them we refer to as "the Information Management Body of Knowledge" – IMBOK as it is commonly known.

Origins of the IMBOK Framework

At two facilitated workshops in Cape Town in 2003, more than 70 people (from education, business and public administration) met together to discuss the problems in delivering the benefits of information technology-related investments. Before attending, they had been invited to ask themselves the following questions:

- Are you getting measurable, timely, benefits from your IT investment?
- Are your IT resources fully and effectively deployed?
- Are your information resources well managed?
- Are you driving your IT strategy, or is it driving you?

Significant challenges were found to exist in several areas of information management, specifically in dealing with strategy formulation and implementation, in the development and delivery of new systems, and in the successful exploitation of new systems. Key role players – business, government and educators – all need to devise more effective mechanisms for co-operation and mutual investigation of problems and opportunities.

There is a clear vision of an improved future, where IT and business strategies are aligned, management of information systems projects is under tight control, and business people are empowered rather than inhibited by the systems that they are asked to use. There was agreement that the significant problems that we face in realising the vision can be addressed by an effective partnership between the key role players and by effective, pragmatic, applied research founded in a partnership between business people, managers and academics.

But this future will not be achieved easily. There is widespread concern at the lack of appropriate IT capability in organisations of all kinds. Some critical competencies – all concerned with management – recurred several times in discussions: *strategy management*, *information management*, *project management*, *change management* and *service management* all featured more than once. It was determined that one important step would be to assemble a body of knowledge concerning these things, to assist managers, researchers and students.

That is the purpose of this document: to collect, collate and organise some of the best thinking about information management.

A simple example

Evidently, the challenge is to find the managerial connections between IT, the information systems that serve business needs, and the strategic objectives of the business. Sounds simple? It is not - it's a complex managerial challenge that cannot be met by IT people alone.

Consider this example:

> *Gerry came upstairs from the computer room and met Sara, who works in marketing.*
>
> *"Hi, how're you doing?" he asked.*
>
> *"Fine" she answered. "We just had a great meeting discussing the new web site. We want to build some new features that will allow personalisation of the home page for our regular customers". She knew that Gerry would be interested.*
>
> *He was. "That's great – when can we get started? I've been playing with XML and the new secure server platform, and I'm sure we can work up some great ideas for you".*
>
> *Sara wondered exactly what XML might be, and whether this was the seventh or eighth new server that the IT department had bought for themselves in the last year. She then wondered where the conversation might go next, and decided to cut and run.*
>
> *"Yeah, sure, let's meet soon and talk about that!" she called as she turned to go down the corridor to her office in the marketing department.*

What do you notice about this example? Although it is short, it is quite believable and makes one or two things clear.

- Gerry gets a clear message that there is a need in marketing, but the implication is that there was no one from IT at the meeting. *Is that what you would expect?*
- Sara gives a short, sharp description of the need, but Gerry fails to engage with her concerning the details. He seems to assume that it is a good thing. *Is that what you would expect?*
- Gerry talks of XML and secure servers. Do you think that Sara would understand what he was talking about?
- Sara did not challenge him to explain about either XML or security in server platforms. *Do you think she should have done?*

Neither person made any attempt to examine the interesting middle ground between the information technology (that is clearly "home ground" for Gerry) and the needs of the business ("home ground" for Sara). We have three levels in mind: information system, business process and business benefit. What systems, processes and benefits come to your mind? It does not matter what kind of business this is – just sit and think for a moment before going on …

Building bridges

The casual exchange between Gerry and Sara might be typical of your experience or it might not. It might be a large business or a small one, but at least we learn that there is an information technology department, and we learn that there are almost certainly some problems that are quite typical of situations in organisations. Let's explore the middle ground briefly, in order to see whether we can build any bridges.

- What exactly is the **information system** that will serve the needs of customers in a more personalised way? Is it an order entry system? An order status checking system? A cataloguing system? Or, is the personalisation about providing customers with only the web functionality that they need? Is it an existing system, or will it be a new one?

- What is the **business process** that will benefit from new systems?   Is it "customer order fulfilment"? Or, "new customer acquisition"? Or, "customer relationship management"? Or, will it embrace all activities that relate in any way to customers?

- What will be the **business benefits** of the new system?   Are we concerned to increase the number of customers? If so, how can we be assured that this will happen? Are we aiming to get more business from existing customers? If so, same question: how can we be assured that this will happen? Are we simply trying to retain existing customers?

Bridging the gap
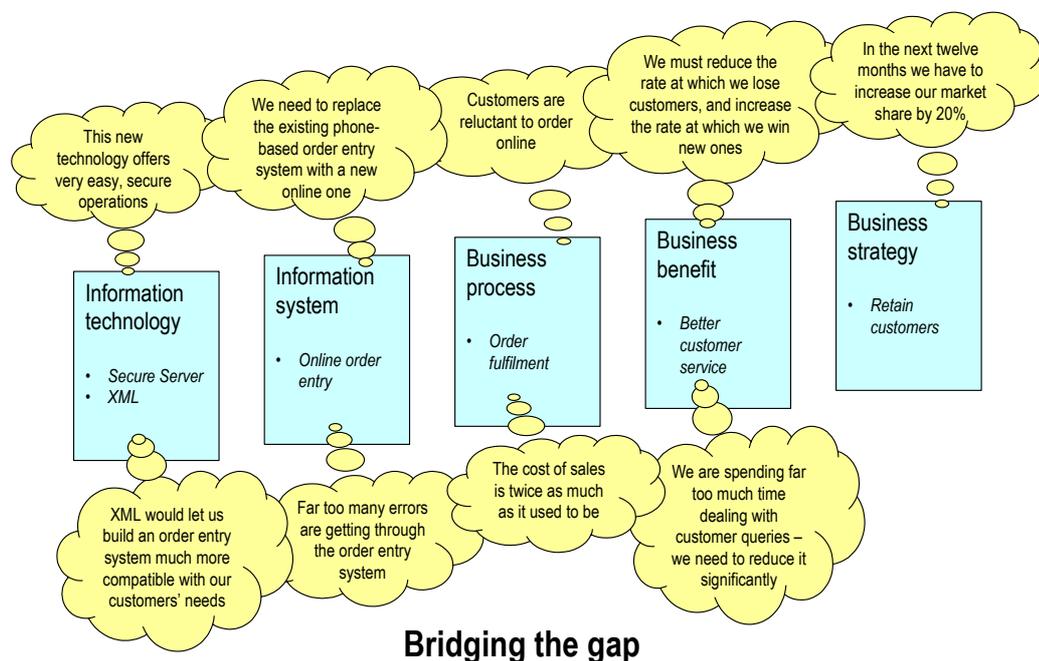
When managers make decisions about information technology and the information systems that are built with it, there is a very strong tendency to decide on an arbitrary basis. "*Our main competitor has done it, so we must do it too*". "*Gerry thinks it's a good idea, and he is good with IT, so let's give it a try*". These are not reliable arguments for spending large sums of money.

The annotated figure above shows how we can begin to construct a coherent argument that joins strategic intentions to technology opportunities, by answering some of the questions above.

This is the way that the IMBOK works, and we must now explore the details more carefully.

The IMBOK Framework

The basic outline of the body of knowledge has been seen already. A more complete version of the framework includes *knowledge areas* (the blue boxes) and *processes* (the yellow arrows).
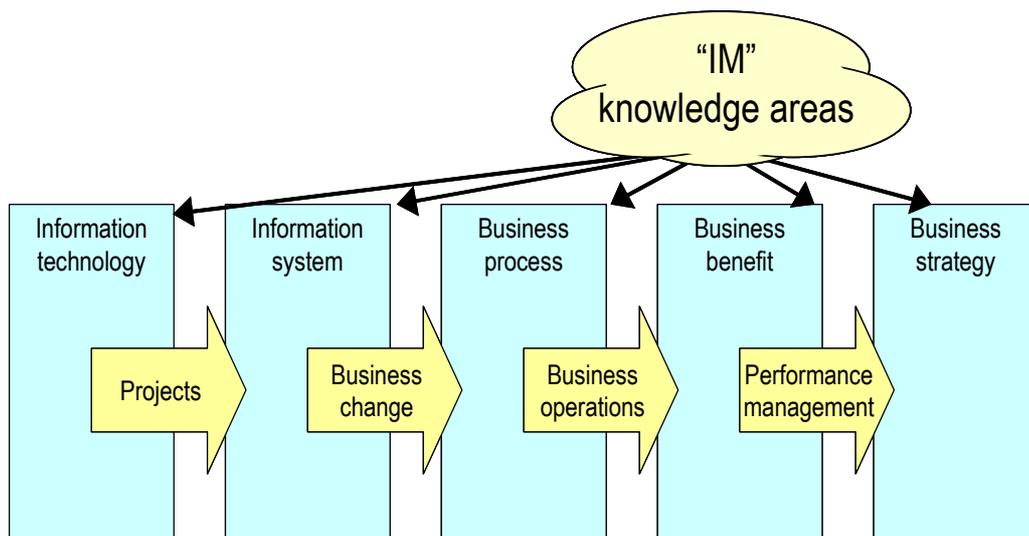
**The Information Management
Body of Knowledge**

The knowledge areas

- **Information technology:** The world of technology is constantly changing and presents special challenges to those who would wish to understand it. An IT support group in a large organisation will know all about the different technologies used – the communications kit, the database software, the operating systems, and even the physical infrastructure that houses the technology – but what can a smaller business do to protect its interests? And, what do we all need to know as individuals if we are to make the best possible use of technology? If new technologies appear every three months on average, do we need to update our investment every three months? If we do not, what is the consequence to be?

- **Information system:** We make sense of technology by engineering it into information systems that include not just the hardware, but all the components of a working system *including* the human capability to work

with the system to deliver outputs. Information systems have traditionally been developed and maintained by the systems development department. There we would find systems analysts, database designers, specialists who can test systems and make sure that they work according to the specification. But today things are changing. Organisations are realising that they share information systems needs with other organisations, so why should every one suffer the cost of designing and building a unique solution to a shared problem? The *software package* has emerged as the preferred approach. From small personal productivity software that costs a few hundred dollars, to huge enterprise-wide systems that cost millions, the expectation is that we will buy a ready-made solution rather than struggle to build our own. Exceptions are still to be found where a business has a truly unique requirement, or where a business sees an opportunity that has not yet been exploited by others.

- **Business process:** Information systems are applied to business processes in order to improve them. We may wish to make more widgets, or to make them more cheaply, or both. We may wish to increase the information content in our processes that deal with customers, so that we can relate to customers more closely – large businesses have become very interested in how they can use information technology to appear smaller through more intimate relationships with their customers. However, business process management is a relatively new idea (less than ten years old, in the view of some experts) and has been difficult to develop successfully. A simple view is that a business process is something that extends from one boundary of a business to the opposite boundary, for example "customer order fulfilment", or that it delivers an outcome that is of direct concern to a specific stakeholder, for example "supplier management" or "shareholder relations". Those organisations that have adopted business process thinking would say that processes are the responsibility of functional managers: sales managers look after the activities that make up sales; production people look after production; senior management look after finance and corporate administration. However, there is always confusion about the difference between process management responsibilities and the organisation chart (the "organogram" as some people would call it). We must examine these differences and clarify them.

- **Business benefit:** Here is an interesting one. What *are* the benefits that we are seeking? Can we even anticipate them properly at an early stage in the investment analysis cycle? Will the benefits be evidenced through business performance improvement? How are the actions of managers and functional departments currently judged? By financial measures? Sales statistics? Transaction volumes?   This complex area needs to be understood and managed if we are to all work to a common end, but is there a single point of responsibility for the delivery of business benefits? As may be seen from all these questions, the management of business benefits out of information technology investments is not well understood.

In recent years, since the emergence and popularisation of the Balanced Score Card, there has been huge interest in business performance management. However, not much serious effort has been made to relate business performance management to the benefits of information technology investments and the introduction of new information systems. This we will do, through an understanding of the business process.

- **Business strategy:** Most organisations try to work with a strategy that guides their efforts, although the quality of typical strategies varies widely. A business strategy is usually the product of senior management deliberations, but do senior managers really understand what is going on in the business? Sometimes (often, even!) they do not. And, how can we persuade people to act upon a strategy when it is decided and agreed? Developing strategies can be great fun: interesting meetings, challenging arguments, time with consultants, even weekends away from the office and away from home; at the end of the day, a handsome document with a refined analysis and clear targets for everyone to work to. Implementing strategies can be a nightmare: people worry about how it affects them, and do not want to understand how it is dependent on *their* efforts to deliver some of the components of strategy. Strategy formulation is easy; strategy implementation is extremely difficult.

The processes
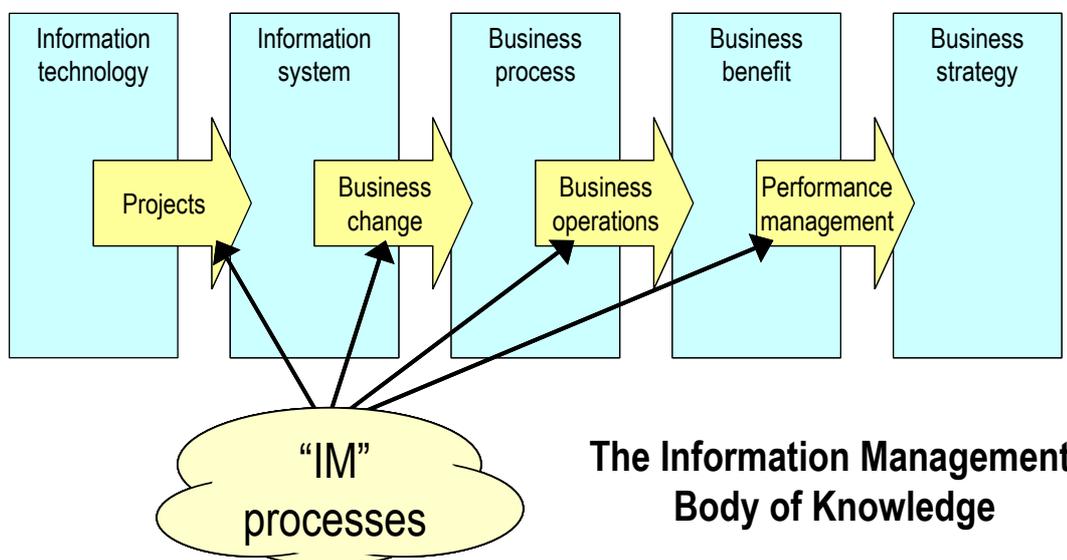
Suppose that we know all about the five knowledge areas. We have experts who know all about the technologies that we use. We have competent systems development staff that can work reliably to deliver good systems that meet the specification of the requirements. Functional management in the main business areas is strong and the senior management team is well informed and sets reasonable targets. Things can still go wrong. The problem lies in the *migration* of ideas from one area of competency to another.

- **Projects:** Information technology is useless until it is engineered into systems that meet the needs of the business. Getting business people to articulate their needs can be extremely difficult. Consider the case where a new customer relationship management system is to be developed, based on web technologies. Customer relationship management is not happening right now, at least not in any formalised sense. So, how can anyone tabulate and describe the facilities and functionality that might be needed? *Project management* is the information management process that delivers systems, and project management is still difficult. Project managers tend to focus on tasks, milestones, deliverables and budgets. It is a rare project manager that can see how all the detailed work in a project will produce the business benefits that represent the fulfilment of strategy.

- **Business change:** The best information systems succeed in delivering benefits through the achievement of change. But people do not enjoy change, especially when it makes new demands upon their skills in the way that new information systems often do. Consider the case where a new sales system allows sales staff to deal with sales orders over the telephone, where previously they were solely concerned with mail and fax orders. The previous expectation was to deal with an order within a week (say), but now customers expect the order to be dealt with in minutes. Telephone skills that were previously needed only to deal with queries and complaints now need to be extended to deal with sales details, and with negotiation of terms and discounts. At the start that is not seen as a problem, but in the event it causes staff stress and they will resent this kind of change.

- **Business operations:** With new systems in place, with business processes improved, and with staff finally ready and able to work with new processes, *then* the business can get to work. By "business operations" here we mean the business at work, producing its goods and services, delivering value to customers and others, and performing to the expected level. We are now beyond the scope of direct involvement of information technology and information systems staff, but we are still very much concerned with the benefits of new information systems as seen through improved business performance. The way that systems have impacted on business operations has changed markedly over the years: from the early days, when all that was needed was a demonstrable improvement in throughput or a reduction in cost, we have progressed to the point where systems will sometimes dramatically change the way that we work. In some retailing businesses, supply-side companies (such as the food producers, or hardware suppliers) are now expected to manage the stock in the retail store directly, providing fresh stock when it is needed rather than waiting for the store management to place replenishment orders. The retailer may be asked to make a commitment to pay for supplied goods without an invoice, on the grounds that the price and the terms of payment are already agreed.

- **Performance management:** In the last few years there has been a dramatic rise of interest in the ways that we manage business performance. From the early days, when financial results were everything, we have moved to a much more sophisticated regime where we strive to balance financial success with internal efficiency, with customer satisfaction, and with organisational learning and development. It is no longer sufficient just to make money, we have to make the customer happy, work to improve internal operations so as to be "best of breed", and we have to ensure that all the time the organisation is moving forward in terms of capability and competencies. Performance management is where business strategy meets business operations, and where the benefits of our investment in better business practice are finally seen and delivered.

Summary

There are always many ways to see a business, and the Information Management Body of Knowledge is only one way. It is important to see how other areas of business activity will also contribute to strategy – it is not only information technology that moves a business forwards. Human resource management, product development and marketing will all have an important role to play in strategic ways, and we must not see one domain of activity alone as the sole source of strategic success.

The next section looks at the IMBOK knowledge areas in more detail, and shows how some of the common management tools and techniques can be deployed to bring the means of strategic success into better focus.

The Knowledge areas

Five knowledge areas stand as separate domains of competence that must be mastered if we are to succeed with information technology and information systems related investments:

- Information technology
- Information systems
- Business processes
- Business benefits
- Business strategy

These are not five sequential areas for managerial action that we must take to develop a strategy from an understanding of technology, or to decide about technology as a consequence of having a strategy. They are five domains of expertise that could not be easily dealt with by a single person. They will be the responsibility of several people. It is the movement of ideas from one domain to another, and from one person to another, that is so difficult.

For years now we have had a strong managerial interest in information technology and business strategy. What has emerged over recent years (and is not yet fully understood) is the importance of the intervening domains: information systems, business processes and business benefits. Each of these featured in the early Cape Town workshops that initiated work on the body of knowledge, but the pattern of dependency was not evident.

We are therefore concerned here to identify and describe "best practice" in the five knowledge areas as it is seen by experts around the world, and perhaps to pin point some areas where further work needs to be done. That is what is done in the pages that follow.

Knowledge area 1: Information technology

Definition of "Information Technology"

> *Information Technology is a phrase used to refer to specific technical components, normally organised as hardware, software and communications, which are used to make up an information system.*

We often say "IT", without thinking about what it really means. For many years "Information Technology" was a phrase that was used to refer to almost everything in the realm of computers and systems in business. As the IMBOK makes very clear, it is a long management journey from investing in raw information technology components to delivering the benefits of that investment, and by themselves information technology components may have no useful function at all. They need to be engineered into usable and useful *systems* that serve a real need.

Nature of technology

 "Hardware", "software" and "communications" are the traditional categories of information technology. Teaching texts of the 1980s and 1990s often tabulate endless examples of each, such as the (limited) lists in the table that follows.

Hardware	Software	Communications
Central processing unit	Operating system	Modem
Disk drive	Job scheduler	Multiplexer
Printer	I/O controller	Networking switch
Keyboard	Program code compiler	Terminal
USB port	Device driver	Communications line
Magnetic tape drive	Database system	Optical fibre

Some examples of information technologies

But, what is the significance of "information technology types" today? When you can acquire a sophisticated cell phone or PDA for just a few hundred dollars (less in conjunction with a service contract) do we care what components there are within it? The fact is that there are many thousands of components in the average cell phone, in each of the above categories. A PDA is an example of modern technology that includes examples of complex hardware, software and communications components. A GPS (Geo-stationary Positioning System) handset is the same, although much more specialised than a cell phone.

Experts are arguing that information technology is now so commoditised that it is no longer important to know its details. It is pre-engineered and pre-packaged so that we can buy information technology from a catalogue and almost literally plug it together and have it work for us in short order. Certainly, putting up a complex web site to support (for example) a cataloguing and retailing system is the work of a few hours. Loading the *content* (the catalogue, and other essential details required to make a working system) will take a good deal longer to complete than the original installation and configuration of the system. The acquisition of much new software is now a matter of logging on to the web and downloading it – even if it is hundreds of megabytes.

Context for use

A more important distinction is between technology that is for our *personal* use (the PC together with end-user productivity software such as MS Office and Open Office), that which is aimed at small businesses (small client-server networks with applications suites such as Pastel and AutoCAD, and web components such as Apache and MySQL), and that which is aimed at larger organisations (larger hardware configurations with enterprise suites such as

SAP and PeopleSoft). There is also a vast range of special purpose technology – principally software – ranging from engineering to financial and medical (and back again). There is an endless list of devices that now routinely include information technology that we might not be aware of: more than half the cost of developing the Boeing 777 aircraft was for software development, more than for the airframe and drive systems; Most modern motor vehicles contain engine control systems based on software and associated automatic controls. Bank cards and ID cards now contain processors and input-output facilities. And so on.

Strategic issues

Where we once talked of the strategic value of information systems, the commoditisation of technology makes that more difficult. Just having technology that another organisation does not have is no big deal – it is generally (but not always) easily available. As Nicholas Carr points out in his interesting paper: "*What makes a resource truly strategic – what gives it the capacity to be the basis of a sustained competitive advantage – is not ubiquity but scarcity*" (Carr, 2003). What becomes more interesting from a strategic point of view is how good an organisation is at acquiring technology, and how good they are at deploying it through innovative information systems. Carr might be right about raw technology, but he can not argue that information systems and business processes are commoditised, and therein lies the opportunity for competitive advantage today.

Acquisition of technology

The evidence points to a worrying mix of challenges relating to information technology supply. Apart from the obvious potential lack of appropriate skills and competencies within an organisation, infrastructure is sometimes inadequate and not well managed and that itself mitigates against successful acquisition. The rapid change in the nature and capabilities of information technology products and services also undermines our ability to manage information technology successfully. Many organisations have chosen to rely on outsourced supply, thereby accessing the skills and competencies of external specialist companies that have chosen to specialise in technology competencies. Some are good, but others tend to "drop the boxes and run" or charge high fees for the supporting services that make the technology usable and useful. We need to learn to manage the relationship with technology suppliers to our advantage. Can we trust the IT Department to do this for us? Do they have the right skills to negotiate well and are they the best custodians of our interests as they negotiate for us? There are different models for procurement – adversarial, negotiated contract, shared risk and shared reward – and we need to be sure that we are adopting the best one for our circumstances.

Managerial issues concerning Information Technology

The worrying information technology supply issues are matched by problems in the forward vision. Effective project management, fulsome communication between role players, application of appropriate standards, proper planning and effective management of technology and technology suppliers all feature in the debate about a vision. We need strategies to deal with technology supply as a component of strategy overall. At the time of writing (2004), people in business want to understand more about the opportunities offered by "open source" software and they look forward to a fully competitive telecommunications regime. Skills may be available but staff must be motivated to work well and not to seek employment where the grass might be greener.

Perhaps the most important aspect of information technology management is to ensure that IT is used well. It is frightening to reflect on the power and capability of the modern personal computer and then to reflect on the extent to which it is actually used in the typical commercial organisation. Does that matter? Yes, it does. Although the cost of a typical PC has reduced markedly, the total cost of ownership includes all support, consumables and maintenance and has been estimated as high as $50,000 over the life of a PC – this is dramatically greater than the $1,000-2,000 that represents the original capital cost. Carr reports that and estimated $2 trillion is spent world wide on information technology each year. How much of that investment is well spent, and how much of the technology is well used, are interesting questions to ponder. It behoves every organisation to find a way to monitor the usage of technology and to weigh the demand for investment against the benefits. We shall come to that later in the discussion.

By way of summary, here are some of the managerial issues that we must deal with in the domain of information technology:

- **Managing suppliers:** We need to understand the kind of relationship that we would best have with our technology suppliers. Generally it might be most appropriate to have a transactional relationship, but sometimes there is merit in working more closely with suppliers. Different kinds of supplier relationships need to be recognised and managed appropriately, and the cost of dealing with suppliers must be understood and managed. It is worth remembering that sometimes it is important to be a good *customer*, and pushing suppliers to the point of abuse is not always a good idea.

- **Acquiring technology:** More specifically, we must manage the acquisition of technology well. It is so very easy to spend excessively on technology because of the difficulty in seeing its effective use and the benefits that might arise. Tendering procedures are appropriate in some circumstances and must be well managed. Clear criteria are needed for

deciding what kind of supply arrangement to choose in difference circumstances.

- **Managing the technology portfolio:** It is useful to see the current investment in technology from a portfolio viewpoint: some technology will be working for us right now, and some will be the basis of future technological success. A portfolio view will ensure that technology requirements are well aligned with business strategies. It should also ensure that an organisation knows what technology it owns and where it is located – that can be a very real problem as the size of technological components reduces and the value increases.

- **Technology competencies:** Even if relying heavily on suppliers to be skilled in dealing with technology, it behoves every organisation to maintain appropriate competencies in order to track technological developments and to understand what information technology is and where it comes from.

- **Budget management:** It is unlikely that a single budget will be most appropriate for the acquisition of new technology. In some cases it will be most appropriately funded through centralised capital budgets, and in others through local (even departmental) budgets. Policies need to be in place and need to be understood.

For clarity, we need to be careful to use the phrase "Information Technology" to refer to the technology alone: information technology is the hardware, the software, the databases and the communications networks that comprise the automated components of an information system. Any one of these – hardware, software, databases and communications – breaks down into its own complex hierarchy of components. For example, software includes operating systems, middleware, application software, browsers, language systems and so on. A full "family tree" of information technology components would be very complex and need not concern us here. Here, we are interested in how we manage these things, not how we engineer them.

Having said that, the skills required to engineer these technologies and to make useful systems out of them are difficult to learn, and do not sit well with the requirements of business people who just want the system to be delivered to their desks and who are not interested in the complexities of technology. Hence, if we are to manage information technology successfully, we need to encourage the proper use of the phrases "Information Technology" and "Information System" to indicate that there are two layers of different activity and management concern, that are related but separate from each other.

Knowledge area 2: Information systems

Definition of "Information System"

> *An information system is not the same as the technology upon which it is based: it is the totality of technological and human components that work together to produce the information systems and services that a business needs, and that processes information for some organisational purpose.*

We usually use the words "information" and "system" without thinking what they might mean. Just take the word "system" alone - it has many uses and many nuances, from talking about national politics ("political system") to obscure aspects of science ("eco-technology systems").

And then, "information" is one of those words that make less and less sense the more you think about it. The combination of the two words – "information" and "system" – is often seen as synonymous with "information technology" or just "IT", but here we will make a very clear distinction, as indicated above.

Nature of Information Systems

In this way, an information system has to be a reflection of the business, its style of operation and what it actually does, just as a house is a reflection of what we want to do at home and the way we want to live. The analogy with housing is a useful one: to build a house we need bricklayers and carpenters, and to build an information system we need programmers and database designers; the house is specified by an architect, an information system is specified by a business analyst.

This analogy with houses is not to "put down" the skills of programmers and database designers, because as soon as you investigate what makes up an information system and compare it with what makes up a house, you realise that information systems are infinitely more complex than houses. (And, on the other hand, there is much to admire in the skills of a good bricklayer and a good carpenter that is often missing in the work of programmers and database designers).

There are different ways in which we can classify systems. For example, we can separate them according to:

- **The degree of formality:** Some information systems are almost entirely informal, or *ad hoc*. For example, in an organisation much information is communicated through social processes, whether by face-to-face conversation or using email messages. Are we to regard this as a kind of information system? Yes, surely we must. Such systems become more formalised when they are brought into "discussion forums" and "electronic conferences", where there may be someone who moderates and organises the contributions to the discussion because now everyone can see what others have said. And, there is a formal record of what has been discussed and – in some cases – decisions that have been reached. As we progress our thinking to the large volume routine information systems that produce orders, invoices and payments, there is clearly a much higher degree of formality because of the rules of doing business with others. On the other hand, some strategic information systems, for example those that support customer relationship management, may have more flexibility and less formality in some functions, for example where sales people are expected to make open comments about the relationship with a customer or to record the outline of a telephone conversation. As we reflect on the different levels of formality that may be involved, we begin to realise that the workforce needs to adapt to it and may need to be trained in order that they can do so.   Clerical staff who have been trained in specific data entry techniques might really struggle for a while when they are moved on to work with systems that have fewer rules and no constraints on data entry.

- **The degree or extent of automation applied to them:** Historically the more routine and formalised a system is, then the more likely it is that it

can be automated – possibly to a very high degree. However this is no longer always true. Consider the case of call centres, where there is an interesting combination of structure (most call centre operators are working to carefully designed scripts that guide them through their tasks) and informality (at the end of the day, call centre operators are working with people and there must always be some latitude in dealing with people who might be angry, anxious or frustrated).   Consider the differences between an ATM cash dispensing system that is almost completely automated so that it can provide four or five basic services, and a telephone banking system where skilled operators are able to undertake almost all conceivable banking transactions. The degree of automation is very different because of the different scope of what is offered. There is a limit to what can be automated in most businesses. Health care, for example, is becoming much more automated but the human contact is absolutely critical to providing satisfactory health care services.

- **Their relation to decision making:** For some years, there has been very specific interest in information systems that support decision-making. It has become a commonplace to remark that "data, when read, becomes information; information, when understood, becomes knowledge". The next step is to ask what is knowledge when it is deployed, but for most of us knowledge deployed is simply a decision that is taken – a *well-informed* decision, one hopes. It is interesting to look at models of how businesses work, plotting the movement of information from one point to another, and to realise that decision points are not always fully informed so that good decisions can be taken. In one model of an international supply chain, decisions taken by large-scale fishing operators were based on a single inaccurate memorandum from a different continent, that purported to communicate the level of retail demand in Europe but in fact was based on a single manager's whim (Bytheway, 1995). Management decisions need to be properly informed, and are often seen at different levels: strategic decisions that will affect the future performance of the business must be based on information that probably comes largely from outside the organisation; control decisions that affect current operations at the level of production control and forecasting must be based on information that comes from daily and weekly reports; and operational decisions that affect working on the ground on a moment-to-moment or hour-by-hour basis, based on information about current operations and according to well-defined rules.

- **The value to the organisation:** Perhaps the most interesting classification of information systems is the way in which a system provides value to the organisation. Some information systems are deployed only because they have to be; for example every business must manage its books of account, and the only sensible way to do that for substantial businesses is to automate them. But, what is the value? Statutory requirements are satisfied and directors of the business can relax in the

knowledge that they will not fall foul of the law. On the other hand, an information system that is truly strategic and that wins significant new business delivers real value – to the business, to its shareholders and to its employees. How odd it is that so many businesses try to manage all information systems projects in the same way, without recognising the significant differences that can arise from the nature of the *value* that the system will deliver. Management thinking has migrated over the years from investing in systems that provide purely internal (and relatively limited) benefits, to much more ambitious systems which stretch beyond the boundaries of one organisation, and may in the end involve whole industries.

Information systems maturity

The 3x3 figure (below) shows one view of the way that the nature of information systems has evolved over the years, based upon the change in the **benefits** that have been sought, and the **scope** or reach of systems. Each has gone through three stages, as shown.

Mapping benefits to scope

	Efficiency	Effectiveness	Evolution
Corporate level	Traditional Data Processing (Accounting, payroll) **1** '60s	Key operational systems (Stock control, Sales order processing) **2** '70s	Competitive systems (Customer & supplier linking) **3** '80s
Community level	Electronic Data Interchange (Direct ordering, invoicing) **4** '80s	Rationalisation of processes (Sharing operational information) **5** early '90s	Widespread disintermediation (Supply chain optimisation, emergence of the Web) **6** mid '90s
Country level	Cross-industry data flow (Rise of regulatory systems Endemic use of the Web) **7** late '90s	Trans-national systems (IT spills out into communities of all kinds, eCommerce takes off) **8** 2000s?	Sovereignty of information Decline of geo-political structures **9** 2010s?

Scope *Benefits* → *Progress*

- Benefits in the beginning are seen as simple efficiency benefits, later an organisation will seek effectiveness not just efficiency, and ultimately a progressive organisation will seek to evolve its very nature through the more advanced use of information systems.
- Scope is initially within the single organisation, but as maturity of use emerges a business will seek to link its systems with key partners, especially suppliers and customers. This we can see as a community effect. Ultimately, systems are seen to be important at the national level and we

may find that we are soon challenging the very concept of what a country is.

These two things – benefits and scope – characterise the change in the nature of information systems over the decades more than anything else. The combination of the two, as each progresses from the early to the later stages, reveals much about how management thinking has developed over the years. Each of the nine "boxes" in the figure has been numbered. The notes below discuss some aspects of each of these nine stages (but by no means all aspects – that would be a huge task), in the same sequence.

- **Stage 1 - Internal efficiency:** Initial activity in most organisations (typically about 40 years ago for the 'early adopters') concentrated on developing systems for the purpose of improving internal efficiency. Tasks that were already undertaken by clerks were computerised with the intention of reducing staffing levels. Tasks such as invoicing, accounting and order processing were developed to mimic the manual activities replaced. The "DP (Data Processing) Department" had been born. Information technology tools were developed to meet the needs of such systems. Large numbers of technicians were recruited. System flexibility was not especially important, as the systems developed did not change very much through time.

- **Stage 2 - Internal effectiveness:** As time passed, attention turned towards using information stored in the early systems to improve management. "Management Information Systems" were born. The information in question related to the internal workings of the organisation, and the intention was to summarise it for the purposes of management. Major problems developed, because the tools available to develop systems were those first used for data processing. Flexibility was required by the users but was not really available. The underlying systems and the tools for systems development were inflexible and difficult to use.

- **Stage 3 - Internal evolution:** Moves to integrate information systems, and the confidence that was ultimately gained in developing systems, led management to understand that systems could change the business. Not only could information services be added to conventional products and services, but new revenue streams could be generated and – in exceptional cases – the DP department was floated as a separate business offering data processing services to all comers. For example, motor car manufacturers could provide a very high degree of personalisation on each car, thereby earning a premium price, yet contain manufacturing costs within the mass produced sector of the market. Add to this a high level of customer service based on maintaining information *about* customers and their use of the vehicle, and suddenly it is not just about cars that appeal to discerning customers, it is about additional revenue earning services.

- **Stage 4 - External efficiency:** The boundaries of business are widening, and the boundaries of the systems that serve business are widening even more. Organisations realised that it is inefficient to print out an order on

paper and to post it to a supplier, just so that the supplier can key the details into their system. Systems owned by different organisations were connected to form "electronic data interchange" (EDI) networks that overcome these inefficiencies. Orders, invoices, product specifications and other information is now transferred electronically. Efficiency is the main benefit, but now it has an external focus and is shared by whole communities of businesses.

- **Stage 5 - External effectiveness:** With experience of EDI efficiencies, and having achieved internal effectiveness through second-stage systems, progressive organisations then realised that there was potential for improved effectiveness at the industry level. For example, rather than two organisations carrying stock of a particular item, it would be advantageous for stock information to be shared or even for all stock to be kept in a single place. The first signs emerge of supply chain and industry restructuring, for the mutual advantage of all (except perhaps for employees, who are further threatened by the economies of scale and the rationalisation of business processes).

- **Stage 6 – Industry evolution:** Sharing information and optimising stockholdings led to a change in the structure of industries. In the travel industry there was widespread rationalisation. In fast moving consumer goods, there was rationalisation of warehousing and transportation arrangements. The very question of who owns goods as they move through the supply chain was challenged so that the original manufacturer could retain ownership (and responsibility for stock management) right through to the point where a consumer buys it over the counter. A business making tooth paste, that earns no revenue until the toothpaste is finally sold to the consumer, has to seriously change its view of business operations. Suddenly it is not about chasing payment of invoices to retailers, it is about a fine level of stock management at many levels in the supply chain. Huge rewards and cost savings can be gained if such improvements can be made to work. With this new kind of thinking, customers can raise invoices on themselves, and suppliers can raise purchase orders on behalf of their customers. It started to happen in stage 6, and it still happens today.

- **Stage 7 – National and international efficiency:** There are examples where whole countries have adopted information systems at the national level, to improve efficiency and to create an attractive environment for inward investment and to attract international businesses to come and work there, rather than in other countries (even, their home countries). Singapore comes to mind immediately, as the classic case of national investment in information technology, right back in the 1980s. It has paid off handsomely. Singapore has highly efficient banking and trade management systems, and more than half of its GDP is generated through *other countries' trade*. At the same time, the World Wide Web emerges as a primary force for computerisation on a national and trans-national basis.

- **Stage 8 and 9 – National and international effectiveness, and evolution:** Suddenly we begin to ask ourselves whether we really understand what a country is. The idea of the *community (of practice, of interest …)* rises to the fore and it begins to be more important to know what information privileges one has, rather than what country one comes from. From the awful level of terrorism, which is clearly becoming a trans-national affair and which is very concerned with information technology and information systems, right through to internet trading where one is almost entirely unconcerned with where goods might be coming from, we are all, as individuals, becoming less sensitive to national issues and more concerned with information privileges. We need broadband Internet access, because a 56kbs modem is not sufficient to browse and buy at the pace we wish to. Community usage of information technology and systems becomes a primary driver for the IT industry and the formalised markets for "traditional" IT services begins to fade as commoditisation takes over. Interestingly, information technology skills become more ubiquitous just like the technology itself and the long-held shortage of skilled personnel is suddenly not such a critical reality. Ordinary people begin to do extraordinary things with web technologies and a whole new approach to information systems emerges. We are living with this phenomenon right now (2004).

Having painted this quite complex picture of the evolution of information systems, in most organisations today, stages 1 and 2 best describe the way in which information systems are managed (although the evolution of systems thinking is of course a continuous process and the edges may be blurred). Stages 4 to 6 are typically "under development" even in some of the most progressive businesses; Stages 7 and 9 are formative still, and we may find that there are more surprises just around the corner.

The extent to which an organisation or an industry has developed its thinking within this framework (even a whole country) is a good indicator of its information technology and information systems maturity. By examining the application of information systems in this way it is possible to see the benefits that are being achieved, and the benefits that could be achieved in the next major phase of development. We learn that *maturity* of thinking about information systems is a key indicator of other aspects of the IMBOK: the nature of business processes and attitudes to their management, the kind of benefits that are sought from information technology investments, and the kinds of strategy that might prevail. But before we press on to look at these "higher" level domains of the IMBOK, we must examine some specific aspects of information systems: how they are specified, how they are deployed, and some of the current management issues that they raise.

The applications portfolio

Because attitudes to information systems shift with the maturity of the idea, and with attitudes in business and society, we have to find a way to manage information systems differently from time to time. An information system that is a source of competitive advantage presents certain challenges, and one that just shaves a few percentage points off operating costs presents other challenges. For years this was acknowledged but there was no widely understood scheme whereby the *differences* between systems could be explained at a strategic level, and the consequences for management could be understood.

One scheme that has found almost universal favour amongst those managers that have studied it is to work with a *portfolio* approach. The essential idea originates from the realm of marketing, where for many years there have been models that highlight the differences between products (in the general sense) at the early, middle and late stages of their effective lives. That idea is the "Boston Box" (it will be described in detail in a later section dealing with strategic analysis tools).

The Boston Box is a portfolio model that organises the life-cycle of a product into four stages, each of which is named in a way to reflect the status of the product at that stage: *wild cat*, *rising star*, *cash cow* and *dog* are the names normally given to the four stages, broadly relating to innovation, adoption, deployment and decline of a product.

Information systems also have a lifecycle, and the portfolio model applied to information systems is generally known as the "Applications Portfolio". By regarding an information system as a "product" that migrates and matures through four stages, we might find that many managerial issues start to fall into place. (Note that here we use the terms "application" and "information system" interchangeably).

This is indeed the case, because information systems were seen for at least twenty years in a very *singular* way, when they are not a "singular" problem. In the early days differences between different kinds of information system seemed to be of no great concern (and were in any case less marked than they are today). More recently, the differences are very significant and there are endless examples where information systems that were innovative or experimental in nature were forced through a conventional systems development lifecycle, sometimes to fail completely but at best to succeed only with great difficulty.

In the face of difficulty, the tendency in the past has been to introduce more particular standards, more rules and more procedures, in order to "tighten up" the way that systems were being produced. This is appropriate in some cases but not in all. There are *at least* four different kinds of situation that we might find, each requiring a significantly different managerial approach.

We will adopt the Applications Portfolio in order to explore the differences between different kinds of information system. We name the four quadrants as follows:

- High Potential (Wild cat)
- Strategic (Rising Star)
- Key Operational (Cash cow) and
- Support (Dog)

Not so evocative, but hopefully indicative of what is intended. Here is the applications portfolio, with each of the four quadrants defined:

Future potential	*STRATEGIC* *Applications that are critical to sustaining future business strategy*	*HIGH POTENTIAL* *Applications that may be important in achieving future business strategy*
	KEY OPERATIONAL *Applications upon which the organisation currently depends for success*	*SUPPORT* *Applications that are valuable but not critical to success*

The Applications Portfolio   _Current relevance_ ←
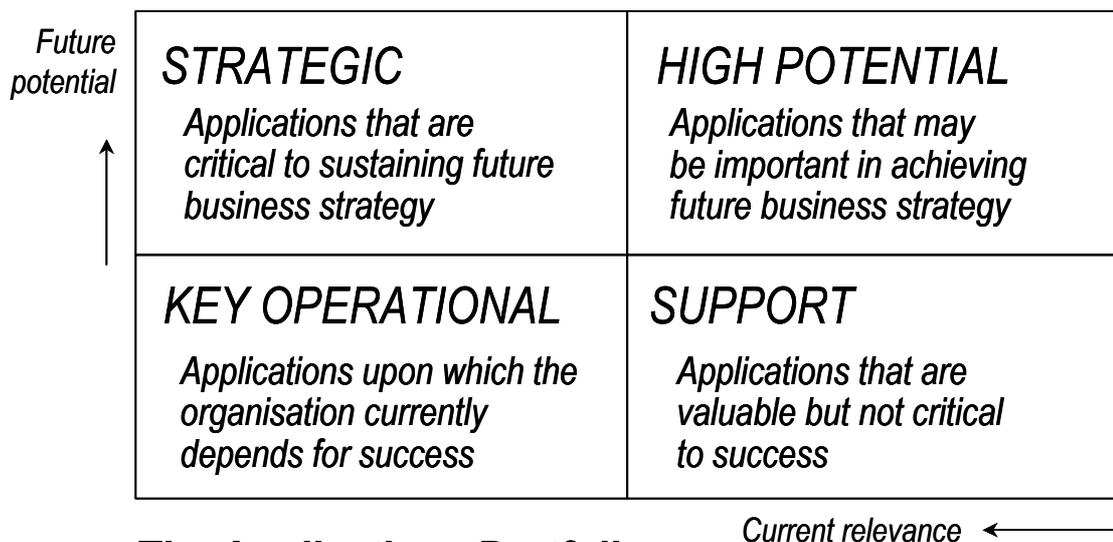
High potential information systems

Applications that may be important in achieving future business strategy

A small proportion of high potential applications might ultimately provide strategic opportunities and help to secure the future of the company. A progressive organisation recognises this, and finds a way to encourage innovation by investing in the future. Laggardly organisations do not recognise this, and generally wait until competitors have established a new information system idea before making the move (by which time the system idea is no longer "high potential", nor even "strategic, perhaps). An organisation that refuses to enable high potential activity will always lag, whereas one that nurtures and sustains experimentation will never be short of potentially useful systems ideas.

How does one go about systems development in this quadrant? Not with meticulous attention to standards, nor even with large teams of specialists drafted in to assist. Development in this part of the applications portfolio has to be done by (or in very close conjunction with) the user whose idea it is.

The objective is not to change the world nor even to actually implement a working system, but to qualify an information system idea as a good one. Once this qualification is achieved, when everyone agrees that the idea is important, and when the rest of the company has agreed to take it on board, then the style of development will have to change. But until it is approved as a legitimate strategically relevant idea, development needs to be fluid, exploratory, and as rapid as possible. There is no benefit in protracted development; every effort should be directed towards the qualification of the idea, as quickly as possible. If the idea proves to be a good one then it can be progressed, but if it is not then it can be discarded. Survival in high potential systems development activity is as much about failure as it is about success.

Strategic information systems

Applications that are critical to sustaining future business strategy

A strategic information system needs to have the support and commitment of business management and all involved staff. Changes to business practice will be involved and the management of change requires a high level of commitment. The specification of requirements must be done with the business in mind and with more attention to what *might* be done in the future than what *is* done now. Thus, we might say that *business* analysts are required, not *systems* analysts. Good business analysts are difficult to find because they must straddle the divide between the worlds of technology and business; some of the best examples of success can be attributed to talented people who acted in this role and did well, in other cases people have failed in this role and disaster has ensued. Even the best technical specialist will probably fail if given responsibility (by design or default) for the conception and specification of a strategic information system. Business analysis is difficult in the strategic context because of the need to explore new territory, where users will not be able to articulate their needs straightforwardly. A degree of experimentation will be required.

The tools that are used in these cases may be different. The challenge is to formulate and test new ideas about the business in order that they can be realised by means of new systems. The ideas may originate from the high potential quadrant of the portfolio or they may be seeded in corporate strategy: objectives, critical success factors, and the other stuff of strategic analysis. It is important therefore that the communication of business ideas (using appropriate models and possibly prototype systems) is not just encouraged but driven by means of energetic management activity and commitment. In this way all those involved will be able to assure themselves that the proposals are appropriate and stable. Strategic systems are demanding of management time, principally because of the effort that is required to grow an idea, test it, and then settle it down to the point where it can be incorporated into a new system design.

Then the construction of a strategic system needs a particular approach also. The trick is to work quickly because one is seeking competitive advantage and always working within a window of opportunity that might be usurped by competitors. Clearly a new strategic system must work at a functional level and to some extent it will have to integrate with existing systems, but one can not afford to let the IT team dwell upon fine points of detail. It is important that strategic systems are built quickly and competently, but in most cases they will be re-engineered in due course for efficiency of operation. At the start, efficiency in operation is not as important as simple functionality, but nevertheless the development team must try to forecast the workload levels and ensure that there is enough capacity in the infrastructure to sustain the system in use, even if it is planned to re-engineer it later to make it more efficient.

Web sites are a good example. Most large banks have been through the early stage where the critical objective was to get a web site up and running, knowing that the demand would actually be quite low but that the important thing (strategically) was to be able to say that a web site was up and running. Then, famously, a number of banks were embarrassed by the exceptional level of interest, leading to overloading of limited infrastructure and seriously unhappy customers. It is all a balancing act, and we are reminded perhaps that strategic information systems *demand* a culture and a context that is willing and able to deliver change. Without that, an organisation might be better advised not to even start, but to wait until the merit of a new idea has been adequately demonstrated by competitors (so as to be a laggard in these things, not a leader).

Key operational information systems

Applications on which the organisation currently depends for success

Key operational systems are different again. There are fewer mysteries because the area of application is likely to be well known, it is probably already common to all the main players in a certain industry (and so *not* strategic), and there may well be packages available which provide a suitable vehicle for implementation (although they are not always cheap – when consultancy assistance, support and training are taken into account, six- and seven-figure US$ prices are common for the larger enterprise-wide software packages).

Clearly, there is a pattern here. Larger, more forward thinking companies often find themselves blazing a trail with new ideas that are, in the beginning strategic. They put the new strategic systems together the hard way because only they can afford the very high development and management costs involved. They can justify the expense on the basis of consolidating their dominance of a market. When the ideas begin to be adopted by the majority of players in that market then systems tend to become available from independent software suppliers (sometimes in the form of a modification of a system first developed by one of the main market players). At the same time,

these systems can be replicated in competitor businesses more cheaply because the nature of the application has become well known and there will be people around who can be hired for their experience and knowledge of the information systems that deliver it.

Thus, the information systems that comprise the basis of key operational applications may be found as packages and not require bespoke (in-house) development. The requirement still needs to be specified, however, because a good package will provide many options and there will be work to do in setting it up and configuring it properly. Although a package is the primary vehicle for implementation, it still has to be evolved into the information system that the business requires. It is a mistake to confuse the two. If a business decides that using someone else's system can solve their problems, then they will almost certainly have a hard time with it. Even the best packages require substantial implementation effort because it will have to co-exist with other key operational systems and interfaces will be needed. As many organisations have found, adapting an existing system can be *much* more difficult than building a new one from scratch.

On the other hand, acquiring a world-class package and then fitting the business around it can be a quick route to efficiency and effectiveness benefits, provided that all necessary changes to working practices are made. For example, for a period of time many large retailing companies around the world chose to use the same package for their core stock management and purchase order processing (a US-originated package called "World Wide Chain Stores"). This does not mean that the businesses have to be the same: the package just deals with the core information processing requirements at the operational level. Here competitive edge comes from the ability to implement such packages well, and to manage the adaptation of the business to make the best use of it. There is still plenty of scope for competitive differentiation with other application areas.

It follows that the key skills for the successful implementation of key operational systems tend to be technical (concerning the set up and configuration of the package) and managerial (for the implementation of operational changes); but senior management do not need to be heavily involved because we are not changing the world, we are merely optimising it. Efficiency and reliability in key operational systems are important, and that requires technical competencies. Depending upon the hardware and software environment, skilled database and teleprocessing specialists will be needed to set up the right infrastructure; with mainframes, system programmers are needed who can tune the environment to give the last percentage point in efficiency with the very expensive infrastructure that is involved.

Key operational systems are not merely advantageous (as a strategic system will be) – they are essential. Generally speaking, without the requisite key operational systems businesses will simply not be able to operate because they

will not have the basic capabilities that are necessary to be a viable player in their chosen industry.

Support information systems

Applications that are valuable but not critical to success

Support systems are the fourth and final category in our applications portfolio. In many ways they are the most difficult to characterise because this fourth quadrant tends to be something of a mixed bag.

Here we put systems that have little or no *strategic* relevance. As indicated by the definition (above, and in the figure) they are valuable for some reason but not critical to success. Examples are: local systems used by only one department, for example HR systems that deal with remuneration and sick pay; low level systems that might be widely used but are not critical to business operations, for example budget and expense management; systems that serve statutory needs such as import and export statistics reporting; even pervasive service systems such as email would be most appropriately categorised here when they are not being used for strategic or key operational purposes, which seems to be true in most cases.

The temptation with these systems is to invest a minimum of money and effort, and wherever possible to go for absolutely standard packages even if they do not fit well - the presumption being that we can change the way we do things to fit the package. Using a package obviates the need for any detailed design or analysis. A support system needs only a minimum of analysis, first to be certain that it is truly a support system and then to establish the basic fit to the business requirement. Interfaces with other systems must be investigated because any strong links to key operational or strategic systems might affect our view of things - perhaps if it generates operational data the support system is not a support system at all?

We will soon look in more detail at the different styles of management that are most appropriate for the different quadrants of the portfolio but it should be obvious that for support systems the management effort must come from the local management concerned. There is even a strong argument that the funding for support systems must come from local budgets: if the benefits are confined to one small part of the business, or one small area of the business activity, then why should central budgets be deployed? Hence, local commitment must be assessed to ensure that the system is really required, and that those concerned are willing to manage the implementation project and all that goes with it. Support systems do not justify the use of scarce, skilled systems development resources that are more usefully deployed in the other more valuable quadrants.

Having said this, we might note that there are classic examples where support systems were recognised to have strategic potential. The apocryphal American Hospital Supplies case study has been very widely quoted as a strategic example, but it started with a single buyer in a hospital who decided to go

online only because his sales representative noticed they used the same kind of IBM terminal. A support project, surely, as it was originally conceived? Who is going to get excited about a buyer who sets up a link with one of his salesmen? But this was so clearly strategic when later seen in the competitive context.

Classifying applications

Using the portfolio to position future information systems investments is a matter of discussion and consensus. Dealing with *current* information systems may not be quite so straightforward.

In either case, in order to decide in which portfolio quadrant to place an application its value must be assessed in some detail. For example an application might:

- have high future potential which is currently under exploited;
- have the potential to be extended or enhanced to be of more value;
- be more valuable if integrated more effectively or used more extensively;
- be critical to the business but suffer from poor quality data;
- need to be redeveloped to meet changed business requirements;
- be transferred to more economical and up-to-date technology;
- provide more facility than is needed, thereby allowing simplification and reduction;
- have no current or future value at all and therefore should be discontinued.

Based on such an assessment of its value a plan can be developed for each application: the portfolio model helps us to see the investment in terms of resources, funds, risks, and even management style. We can see where effort is currently being deployed and where it will be deployed in order to ensure that plans suit corporate objectives. For example, most companies would wish to focus on strategic and key operational applications but it is surprising how often effort is dissipated in the support category. Remedial actions might include reducing the resources used for support systems, buying off-the-shelf packages to service support applications, bringing in outside manpower, or simply a real reduction in overall investment if neither funds nor staff are available.

The need for discussion

The decision as to where an application fits in the portfolio is not dependent on a simple set of rules that we can apply to determine the outcome. A decision will only emerge from a management discussion about an application, and its current and future potential. In many cases, this will be debatable and may, in the end, depend on quite arbitrary management arguments.

For example, in most organisations email is something that is seen as useful but not critical. "*Every business seems to have it, and our people expect it, so we must have it.*" However, a different viewpoint may emerge from management discussions. email might be seen as the primary vehicle for the movement of operational information and a conduit for a new workflow management system; the intended benefits might be very strategic, being based on new levels of internal business performance that will outdo the competition and set new standards for pricing and delivery of customised products. This is no longer a support idea. It requires that the business be significantly changed and the challenge is not merely to install an email system, but to change the way that people work. The same might be true in the case of maintenance support system, but for different reasons. A major electronics company regarded its maintenance management as a support activity (with support systems), and then decided to outsource it to an electronic components supplier. What was a support system to the major international business became a critical strategic system to the outsource service provider, and we see that a shared system might be in one place in the portfolio of the first partner, but in a quite different place in the portfolio of the other.

Some of the key factors in each quadrant are discussed below, together with outcomes.

- **High potential applications**: The basic philosophy of high potential applications is more in the nature of "research and development" - controlled experimentation to identify the potential benefits, opportunities and costs involved in a new idea. Only when these things are understood is it possible to decide if further investment is worthwhile, and how the next stage of application development should be managed. *The outcome of a high potential application is new understanding, not necessarily profit or competitive advantage.*

- **Strategic applications**: Strategic applications are "business driven" and management thinking about information systems in this category must be driven by the business imperative. The principle risk is that of missing a time-dependent business opportunity. It may be about developing new capabilities before the competition do and the most critical aspect of such systems is managing business change. *To be considered as strategic, any application must address critical success factors and the outcome is new capability and competitive advantage.*

- **Key operational applications**: Key operational information systems have been the traditional domain of the IT department, for which tools and methodologies have been developed over the last thirty years and more. However, with the change to new technologies and with new expectations at the level of whole industries and communities of interest, the nature of key operational systems is changing. Development needs should not be compromised for business expediency – it is critically important that these systems work efficiently and work reliably. Often today packaged solutions

will be chosen as the enterprise solutions available are all-capable and can be seen as defining best business practice. *The outcome of successful key operational systems is increased efficiency, lower costs and more contribution to profit.*

- **Support applications**: Support applications are determined by simple economics. Probably local in nature, or contributing at a low-level across an organisation, cost control will be the main reason for deciding whether to go ahead. This is also the area in which the most packaged software is available because support applications are often generic, or common to all industries. *The outcome of successful support systems is that a local or low level need is served well, and needless expenditure is avoided.*

Issues in managing the application portfolio

Migration around the portfolio

Just as products such as refrigerators and motor vehicles have a lifecycle, information systems (applications) have a lifecycle. We are not thinking of the systems development lifecycle, that is just the cycle of implementation activity that delivers a new system: we are thinking of the *complete* lifecycle of the *idea*.

- In the beginning, there may be an idea that is understood and championed by only one person: a *high potential* application. The potential for the idea has to be explored and appreciated by the company at large before any substantial investment is made. The idea may be rejected and - should it have actually been implemented - it falls directly to the *support* category.

- When the organisation at large has agreed to adopt an idea it becomes *strategic* application. It will need senior management support and it will be expensive in terms of resources required as well as funding.

- Applications that have become widely used in an industry are known as *key operational*, because they are critical to the core operations of a business. Key operational applications are like cash cows; they are critical to the generation of revenue and profit.

- Applications which are important to just one department (such as a specialised budgeting system), or which are pervasive in nature but not seen as strategically significant (like email) are known as *support*: it is necessary for some reason to have them, but they are not critical to current or future success.

In this way we must remember that the categorisation of information systems can change over time, either because of a change in the business context, or because we simply choose to manage a system differently when it makes business sense to do so. Even the humble support system can find its moment of glory, and might lead to the initiation of a complete new cycle of strategic thinking.

Strategic analysis in complex businesses

With all strategic analysis tools, it is important to realise that they only work well in the context of a *single business unit*; Any organisation that is not trivial can be seen at different levels: at one level we have the whole organisation and at the other end of a scale we have the individuals who work for it. In the middle we have departments, divisions and other units that may have different names in different specific situations. Here, as we have noted, by "business unit" we mean a single business unit in the sense of one *that has a single family of products with like characteristics* and *identifiable competition*, and is *at a known point in its business maturity lifecycle*.

The business unit →

Corporation

Groups or divisions

Business units

Functions or departments

Individuals
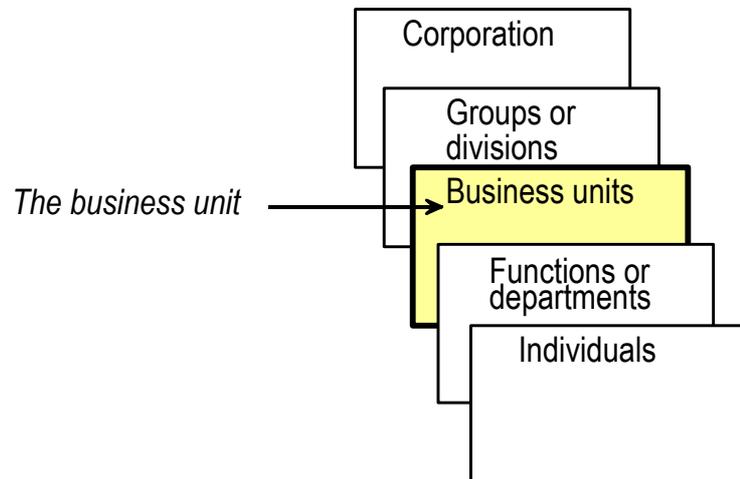
What is applicable and works well within one area of a business might not be applicable in other areas of a complex organisation. Consider a telecommunications service provider. This kind of business comprises many different subsidiary businesses: network engineering, domestic services, business services, data transmission, and so on. Each unit within such a complex business should assess its own needs and develop its own strategic analysis. Data services might be a new business unit with an innovative and rapidly developing product and service portfolio; domestic services might be running down; data transmission might be in the middle of replacing its core infrastructure but otherwise stable.

The portfolio model and the value chains are good examples of the sorts of tool that only work well within a single business unit. A value chain for a complete telecommunications service provider makes no sense because it has many different kinds of customer and it would be impossible to identify logistical and other operations that are in any sense coherent. Similarly with the portfolio, where the significance of a certain information system – even if shared between all units – might be quite different from one to another. Email could be strategically important to a sales office that has decided to use email as the primary vehicle for communication with its customers, whereas for a production unit email is a minor issue that does not affect the outcome of their efforts at all.

The different business units in an organisation are not only concerned with operations, of course. There is the matter of the corporate centre, where policy is made and where periodic targets are set according to overall organisational performance. Information systems strategy for the corporate

centre is likely to concern a minimal set of centralised systems, but with an overall concern for the infrastructure that no single operational part of the business would want to pay for by itself. The wider needs of the operational units within the organisation will all be different and will need different approaches to the management of information systems. As we have noted, one unit might be in a heavily strategic phase, deploying new products based upon a four-year product development plan. Another might be at the end of a cycle and striving to drive all possible cost out of their operational budgets. Another might be working on strategic issues with industry partners, but on much longer timescales than the other parts of the business.

Having said all that, if the business is predominantly in one industry where synergy is a potential source of advantage, a separation of strategic thinking would deny the advantages of that synergy. Individual business unit strategies must be supplemented by some central planning of shared information systems (probably key operational systems) and a firm hand on acquisition and delivery of new systems, in order to avoid proliferation and incompatibility of data.

Thus, strategic analysis tools might be applied to each business unit individually and also to the corporate headquarters. These analyses will identify unique needs but also similarities of need, and thereby the most economic route to overall fulfilment. For each corporate situation a suitably structured mixture can be arrived at. An application portfolio, for example, would be developed for each business unit separately but has the additional advantage that the analysis of need across business units can be consolidated where needed.

Support applications are likely to address similar administrative requirements across the whole organisation and software packages are a common choice: there could be extensive consolidation of systems requirements here. Other areas are less likely to share similar application requirements although the approach to implementation might be common. Take key operational systems: these need to be competently implemented and some of the critical skills are independent of the application itself. For example, project management will be critical to success and might well be provided from the centre; training of operational staff needs training skills as well as application knowledge and might be handled in a central training facility by corporate training specialists. Strategic systems are going to be tightly focused on the parts of the business that are affected, but it might be that the parts in question are subject to new levels of operational integration – that is a common benefit of strategic systems – and central management will have to ensure that operational changes are implemented even in the face of local protest. High potential systems have the least synergistic potential but different uses of the same idea may work in different business units.

Even if the business units are different, the use of similar technology in the different units will enable better quality key operational solutions for all and

therefore a central point of expertise in technology management will be needed. Sharing the advantages and experience gained by one unit with another will accelerate the development of strategic applications and help promote an understanding of how to achieve strategic benefits and how to manage business change, even though specific requirements vary.

Shifting attitudes

At the same time that the application portfolio matches demand for information systems in different business units with the most appropriate means of supply, we must remember that the four segments are driven by different factors and need different approaches to their development and management. The role of systems will also evolve over time and they will need to be migrated from one portfolio segment to another, requiring a change in the style of management over time – sometimes more rapidly than one would expect. Consider again the notion that there is a lifecycle to a systems idea: at some point in time a new idea emerges, it is misunderstood by most but championed by a few (high potential); as the viability of an idea is established and competitive advantage becomes evident it is adopted and approved for wider implementation (strategic); as competitive advantage is negated through industry-wide adoption it becomes something that all industry players have to do; finally, as new ideas emerge and take over, what was once a radical new concept fades into history.

The automatic teller machine (ATM) is a good example. We all take them for granted today, but when the idea was first specified in the National Cash Register Company in the late 1960s (by a group of three salesmen working for NCR's banking division in London) it was met with derision at Corporate HQ in Dayton Ohio. "*NCR is not in the business of knocking holes in the walls of banks*" was the droll reply that came by telex to London. High potential? Certainly. Within two years, when it was realised that IBM was making exactly the same sort of device, NCR finally took the idea seriously and the terminal device that resulted – the NCR770 automated cash teller – was not only better than the IBM implementation but it sold in thousands and bolstered NCR's performance at a time of significant financial difficulty.

Relationship with benefits

There are many stories in the same vein. Although most of us still use ATMS after more than 30 years, with internet banking and smart cards we can now anticipate the time when there will only be a few people who are still anxious to use ATMs and they are seen as laggards, in a world where the majority have chosen to move on and use alternative forms of electronic banking. The important point to realise is that *there is a lifecycle to most systems ideas* and that management recognition of the lifecycle is critical to exploiting the benefits of an idea. These benefits are very different at different stages of the lifecycle.

- **High potential:** At the beginning of an idea the benefit is *understanding*: something that was a mystery to most (but a startlingly good idea to a few) becomes tested and approved for wider implementation.

- **Strategic:** In the strategic phase a system delivers *competitive advantage*: for a period of time (not necessarily a long one) there is a distinct capability that is not available to (or from) others in the industry, and new business of one kind or another is won.

- **Key operational:** As a new idea becomes widely adopted then there is a period of *improved efficiency*: those organisations who are best able to squeeze efficiency out of the system will improve profitability, retain customers and contain costs.

- **Support:** Finally, as an idea becomes less significant, the benefits are either very localised or vanishingly small, and it may be worth discontinuing operation of the system or letting others take it over on an outsourcing basis, as in the case of the Co-operative Bank.

This evolution of systems over time mirrors the evolution of products as seen in the product portfolio. Successful products move over time through a similar life cycle: from 'problem child' via 'rising star' to 'cash cow' to 'dog', before finally being removed from the portfolio. Just as during each stage of its lifecycle a product needs to be managed differently, so information systems need to be managed differently.

Information systems project management

What we learn from this brief examination of the portfolio and the way it illuminates the lifecycle of a systems idea is that different factors affect each stage in that lifecycle. Information systems have to be developed and implemented, and the usual means to achieve that is the *project*: project management must also adjust to the circumstances of the systems idea.

The table below summarises some of the management issues that must be faced according to each of the four stages of the systems lifecycle, as represented by the four quadrants of the portfolio (see the table for the details).

Management style

Generally management can be supportive of systems work and commit a good deal of time to it, or they can decide to minimise their involvement: at some points *business* management needs to be the most involved and at others *technical* management is more important.

Project style

The specific question of *project* management is even more interesting. Because the implementation of a new system must be in some accord with its impact and potential benefits, the approach to project management will be quite different at different stages.

	Management style	Project style	Risk management	Funding
High potential	Loose. Work with the energy and commitment of the "champion" and insist on *closeness* to the actual business.	Light touch. Set clear time and budget limits and then back off, but insist on a final *review* to explore promotion.	Contain overspending through *time and budget limitations*. Close down projects that fail at review time.	*Minimise*: rely on the ingenuity of the champion but provide some seed funding where appropriate.
Strategic	Focus on the *business* and its ability to tolerate and adopt change. Prevent the IT Dept from taking over.	Intense and focused on achieving *business change*. Needs attention to business change issues.	*Time* is the greatest risk: if time is lost then advantage is lost.	*From corporate funds:* these will be *expensive*, both financially and in terms of management time and commitment.
Key operational	Focus on *process* and technical excellence. Allow the IT Dept to lead where appropriate.	*Tight and traditional:* this is the traditional area of information systems activity.	*Quality* is the greatest risk. Key operational systems must work reliably and efficiently.	*From revenue: in principal these systems should be funded from existing sources*
Support	Lean and mean. Limited benefits means that local management should look after these systems.	*Limit to essential needs:* contract out if useful to do so and acquire packages – do not use scarce resources here.	*Cost* is the greatest risk. Work with strict budgets and timescales. Some argue to use *scarce resourcing* here.	*From local budgets*: if the canteen wants a new canteen system, then it must pay for it.

Risk management

Project management is often explained in terms of balancing *time*, *quality* and *cost*. It is interesting that the nature of risk from one quadrant to another runs around this triangle of concerns (with the exception of high potential projects, where the risk is really more to do with the quality of the experiment that is testing out a new idea).

Funding

There is always competition for budget allocation and new information systems investments are no exception. The portfolio model provides approaches to financial justification that suit the context and the expected benefits of each quadrant. The difference between corporate and local funding becomes very clear.

Communicating information systems ideas

We have noted that communications is a key problem in dealing with the diverse issues surrounding good information management. Partly this is because of the very abstract nature of information systems. How do you visualise a system? How can we judge the size of a system? A system has to be engineered, whether by the using organisation itself or by a software package supplier, and therefore we have to have some means to communicate our ideas: to specify the requirement in order that a solution can be designed and built.

Consider a more familiar domain of specification and realisation – house building. We all know what an architect does (do we not?), and we all know how the craftspeople work from the architect's drawings (do they not?). Well, no, they don't always do that. And no, we do not always understand the implications of an architects drawing because it gives us such a limited view of what the end result might be. So, although we do not always get it right, a house *is* something that we can easily visualise and quickly sketch on paper. The question arises: *what exactly is a quick sketch of an information system going to look like*? The hardware can be visualised easily whether it is a personal computer or a multimillion pound mainframe, but it is just a part of the total system. The part that has to be developed afresh every time is the software – the intangible and invisible collation of instructions to the computer that tells it how to work. These instructions are the smallest building blocks of a computer system, but how do they relate to the familiar parts of a house: bricks, slates, timber and internal fittings? A quantity survey of a house is relatively easy to achieve. However, a simple count of the number of 'components' in a computer system is notoriously difficult to estimate - indeed, it is even difficult to agree on what the basic components of an information system actually are.

Our problem is something along these lines:

- Just as with a house, we need a means to design the form and function of an information system, but *unlike* a house the building blocks are not at all clear.

- A house is comprised of bricks, mortar, windows and doors that can be easily quantified and costed, but an information system comprising program instructions, database definition language and job control statements can not be quantified and can not be costed.

- When building a house, the state of completion is very clear simply by looking at it. There is nothing to see in an information system that tells you reliably how complete it is nor when it will be ready.

- If there are faults in the construction of a house they are visually evident, mostly even to an untrained eye, but the faults in an information system may only become apparent when the associated program code or data structures are exercised, and that might not be for a year or two after it was thought to have been completed.

It follows that understanding the business requirement, and then specifying the function and form of an information system unequivocally and reliably, is a critically important thing to get right. Getting it right requires tools for the communication of ideas that may be very alien to the business audience. Someone who has been working successfully as a credit control clerk for 17 years, will not thank some bright young thing from the data processing department for wasting their time trying to document it when (to the credit control clerk) it is just second nature while to the analyst it is a mystery. Add

to that the suspicion that the new information system will put you out of a job, and we have the makings of real problems.

The notes that follow take a look at the traditional approach to requirements specification and then examine why this traditional approach does not always work, and how the process has changed in the era of modern web technologies and other important factors.

Requirements analysis – the key to success?

In the early days of systems development, requirements analysis was a 'black art'. It was so poorly understood that it was barely visible in the average project plan - programmers were simply set to work on programming without any attempt to understand the real needs first. However, nowadays it receives more attention than any other stage in systems development, and the methods and techniques employed are very refined. Graphical techniques are used to represent models of how the system will work. We might not be able to draw a picture of a new information system in the same way that we can draw a car or a house, but we can draw diagrams of how the information will move from one task to another and how the information will be structured.

The early graphical techniques for modelling systems were based on flowcharting symbols signifying disk files, magnetic tape files and obsolete elements such as paper tape and punched card files. This is equivalent to presenting the house buyer with a detailed view of a house, one room at a time, with so much technical annotation about building materials and instructions that it is impossible for the inexpert eye to make a judgement about what is proposed. Happily, today we have a richer array of diagrammatic techniques to help. The general approach is to present a business-level view of proposed systems that can be readily understood and debated, built to rules which are rigorous and which improve the quality of the work. The models that are used provide sufficient discipline to optimise the problem and avoid obvious traps at the same time that they make the specification process more visible to the users.

Consider one of the traps. A strong temptation is to use an organisational model to shape our thoughts about systems. The 'warehouse system', the 'personnel system', the 'head office system', or the 'Newcastle system' are all typical nomenclatures given to information systems and their projects. However, it is no longer sensible to set the boundary of a system using organisational or geographical limits. The systems that will provide an enterprise with real commercial advantage today are those that are shared *across* the organisation (thereby permitting it to operate in a more integrated and timely way) or across a whole industry (leading to the same benefits but on an even larger scale). The organisational model of an enterprise is not adequate as a foundation for the conception and definition of information systems and it actually leads to severe difficulties where function and data are to be shared.

A more considered approach to business modelling deals separately with:

- The organisational elements (departments, units, individuals).
- The jobs that the people do (business functions).
- The information that people work with (files and reports).
- The things of concern about which information is kept (customers, products, employees, branches).

Diagrammatic models can give an accurate representation of these different perspectives on the business. Just as we need to be able to see a new house from different perspectives if we are going to learn all about the internal, external and constructional arrangements, we need to see systems from several different points of view.

The key to good information systems requirements analysis is the ability to break free from traditional business models and to focus on information as the driving paradigm for business design. Diagramming techniques have been developed that deal with this need and they have been incorporated into defined methods for information systems development, redressing some of the historical imbalance towards the technical issues.

Methods, techniques and tools

A good "method" for information systems requirements analysis will use a defined set of analysis activities and techniques that will, by and large, deliver information systems solutions in an orderly, manageable and repeatable manner.

Historically, methods have been offered on a proprietary basis and have been packaged with consultancy, technical support and training, but the detail of different proprietary methods has converged and is now increasingly within the public domain. The United Kingdom government brought one particular method into the public domain and required its use on all non-trivial central government projects – it is known as "Structured Systems Analysis and Design Method" (SSADM) as previously mentioned. However, it has not always succeeded nor has it always been used well. Recent reports indicate that the public sector in the United Kingdom still has horrible problems delivering functional systems to time, and within budget. Perhaps this is because of a persistent reliance on external resources (consultants) who have no long-term commitment to the business of government, or perhaps it is because of a reluctance to educate people in the necessary tools and techniques.

As confidence in information systems analysis methods increases and as more people gain the required skills, it must be hoped that their use will become familiar to many business people. The general move to the use of software packages has allowed organisations to avoid this need, but the parallel problems of assessing packages and understanding the true impact on the working of the business suggest that we still need a means to visualise information systems and their capabilities, even if we are "buying one in".

Would you buy a new house "off the plans" without seeing the plans? Of course not. It is therefore surprising that businesses will buy very expensive software "off the plans" without even understanding how to read the plans, and match them to actual needs. This is an area that has been troublesome for decades, and clearly still warrants more research and more management attention.

Business and systems analysis

There are two principal ways to visualise an information system, namely *process analysis* and *information analysis*. Both techniques can be learned by business people as well as by technical specialists, but information analysis proves to be much more difficult for most people to comprehend. Proprietary methods for analysis are based upon these two approaches and may show a bias towards one or the other. For example, proprietary methods from the USA are predominantly process driven; in Europe there has been a much stronger interest in information analysis, especially in the United Kingdom, France and the Netherlands.

Terminology is not universally agreed and there are conflicting uses of terms such as 'process', 'function', 'information' and 'data'. In particular the advent of such strong interest in business process management (and redesign, and re-engineering) has put a new focus on the word 'process'. There is no universal definition even within the BPR literature.

Here, we shall use certain key words as follows:

- **'Entity'** refers to any element of a business about which we wish to keep information (for example: customers, suppliers, products, employees, sales, problems).

- **'Information'** refers to the aggregation of data that - when it is interpreted and understood - provides systems users with knowledge of some kind (for example: invoice, pay slip, stock exception report).

- '**Activity**' refers to a task that accomplishes the processing of information at a low level, and delivers an output (for example: check customer credit, process sales order, deal with stock enquiry).

- **'Process'** refers to that collection of activities that delivers not output but an outcome – typically something that is valued by an organisational stakeholder (for example: sales order fulfilment, new product design, employee management, and so on).

Hence, we can undertake 'entity analysis' and out of it we should expect to have an agreed set of entities that define the very "stuff" of a business, or we can undertake 'information analysis' and get the outline design for a database – not quite the same thing at all. In the same way we can undertake 'process analysis' for a very high level view of what a business does, or we can undertake 'activity analysis' for a much more detailed view.

In this way, analysis can be undertaken at higher and lower levels. When determining information systems strategies it will be useful to lay down high-level entity models which help to delineate the boundaries of the business: a retailer might wish to explore what the consequences will be of extending the business systems to include customer information, as with the introduction of 'loyalty cards'. When analysing the detail of one critical business process, it will be broken down into lower level processes until we have the level of precision that will properly deal with discounting rules, or quality control procedures.   If the retailer is only concerned to introduce new point-of-sale services, then lower level activity analysis might suffice.

Note the potential confusion that can arise when these terms are used by different people to indicate different meanings – communications will only become more difficult, and it is *always* worth negotiating the meaning of key terms such as these when working in multidisciplinary teams or when working with strangers from a different organisational context.

The notes that follow provide simple examples of process/activity and entity/information analysis, and examine some of the practical issues involved.

Process (activity) analysis

A detailed discussion of the specific tools of process and activity analysis is beyond the scope of this text, but it is worth noting that there are two kinds of diagram frequently associated with function analysis, namely the *process decomposition diagram* and the *data flow diagram*. The first shows how high-level processes are made of lower level activities (in accordance with our chosen definitions), and the second shows how information flows between them. The overall function of a business application can be very complex, but the process viewpoint is a very natural one for people working in the business and the analysis of business processes often provides the most fruitful starting point. Business people tend to be action-oriented and warm more quickly to a discussion about what they do than to a discussion of the structure of the information they are dealing with. Read the example following and think about what you find within it. It illustrates the sort of conversation that might eventuate when a systems analyst sits down with a departmental manager to discuss how things work.

Why don't you tell me what goes on here, then?

OK, if you really want to know! I have a number of people reporting to me dealing with selling, cold calling, re-ordering and sales reporting. They change so quickly, though. As soon as we have someone up to speed they rush off and work for someone else. It follows that we spend a great deal of time recruiting new staff - it's a terrible problem round here and we have to go the full round of advertising, interviewing and so on. I've got salesmen on the road (and women - Janet is in day-to-day charge of the sales force), I've got sales assistants in the showroom and one trusty clerk who keeps me on the straight and narrow. She's called Susan and she's excellent! I couldn't manage without her - she takes charge of the adverts for new hires, and writes all the rejection letters for me. She also arranges the interviewing schedules and deals with the personnel department when I want to offer a job.

Sometimes when there is a crisis I get involved with the travelling and I let one of the sales folk come in and interview the salesroom candidates; nevertheless it's still my responsibility to oversee the interviews and to have the final say in offering jobs. I suppose I also get involved in the wording of the adverts for new staff because the details frequently change, but really I leave most of all that to Susan.

But that's just the staff management side. The selling is what it's really all about. We've got people on the road as I said, who are chasing up new business and dealing direct with the big clients. The staff in the salesroom do the over-the- counter business which makes up the majority of our revenue. I insist on approving all the sales trips and I sometimes insist on going along, for example when the salesman is new or when the client situation is critically important. Then when a big deal is struck I generally go along to join in the merriment! I have to sign off all deals over a certain level, and all those closed by the junior sales people. That's the part I enjoy most. The paperwork is a real drag though. Can't stand it myself. Leave all of that to Susan - she chases up the monthly sales reports from the sales folk and does the area and regional analyses which lead to a summary report for me and my boss. I'm supposed to check it before it goes off but I don't bother. Susan does it all beautifully.   What I do have to do is chase up the damned sales people. They never do what they're told, even for Susan.

I was talking about the sales effort, wasn't I? Yes well, when a salesman is organizing a trip they have to make up their own minds how to go about it and I just check it over (mostly so that I can keep a check on the expense accounts). Susan helps with the travel arrangements when bookings have to be made and she is very involved with the deals. When we are getting near to closing she prepares the draft contracts for us. Sometimes we even have to prepare tenders. Anyway, it falls to Susan to do the paperwork and luckily she's a real whiz with the word processor. She whips out the last one we did and changes the odd word here and there. Terrific stuff, this technology, eh? ...

I guess so! I'll get this written up and get back to you – thanks for your time.

Discussion of the process/activity example

What we find in the example is a rather confused explanation of an undisciplined sales operation. There is no view of *process* here, because the outcome (sales that delight customers?) is not even mentioned. The focus of the respondent is entirely upon the chaotic details of the sales operation, and mostly concerning the mobile sales force, even though (as indicated) more than half of the revenue comes from over-the-counter sales in the showroom.

A second interview with someone in the showroom might produce the sort of model given below. It shows (in a roughly clockwise sense) how the needs of a customer are related to available products and stock availability, and then how stock is picked and paid for. The different symbols used are marked in the figure:

- **activities:** the transformation and movement of information (and goods)
- **flows:** information (or material) on the move
- **stores:** information (or material) at rest
- **outsiders:** people and organisations outside the system boundary

Data flow diagrams are developed using rules which govern how they are drawn, how they relate to one another, and how they relate to the more detailed specification material which supports them. While management will not be involved routinely in creating them, it behoves everyone in a business to learn how to read them and how to make judgements about their quality, cohesion and completeness.
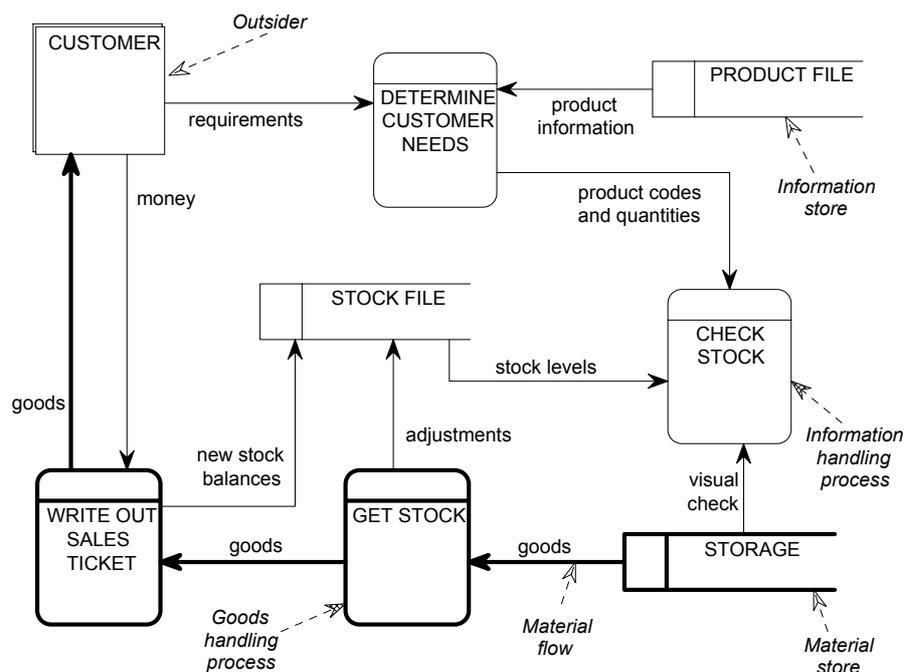
The example given here merely illustrates the way a data flow diagram is used. In a real case, a full analysis would reveal fifty activities (in a small system) but several hundred (in a large system). There might be twenty data flow diagrams in a medium-sized system, showing details of about one hundred and fifty processing elements and the information, which flows within and among them. The total number of detailed system components (processes, flows, stores and outsiders) in these twenty data flow diagrams could be as many as

one thousand – process and activity analysis quickly produces a large volume of analysis material.

Entity (information) analysis

The other kind of analysis is concerned with entities and information, and draws upon all of the paperwork and reports that are evident in a business. It produces what is generally termed a *data model*. This process of information analysis, at a fairly low level, is often called 'data modelling'. Data modelling is a demanding discipline that requires a particularly abstract view of a business. Look at the example interview below, where our analyst learns about some of the information that is used in the business.

Hi Susan – it's good to meet you, I heard a lot about you already.

I hope it was good!

Yes, don't worry about that. I wanted to hear something about the paperwork that you work with here. Why don't you start by explaining what information you have about sales orders?

Sure, no problem. What we have to do is record what our customers buy from us, and in the show room we do that with an entirely conventional invoice. Do you want to hear about the big customers, and the tender documentation, or shall we do the showroom first?

Let's do the showroom and move on when I understand that.

Right. It is a perfectly normal invoice that we use. At the top of the invoice we record the essential customer information – name, address and contact information. Also at the top, we record the invoice number and the date of the transaction. The body of the invoice is made up of all the individual items that a customer has bought on the occasion in question.

OK – I recognise a standard invoice here. What information do you have about the products that I see listed in these examples?

We have a product file in the back office. The showroom staff can access it when ever they need to, to find out a supplier telephone number for example or to get more details about the product. Usually, it is just to find out which bin or shelf where the goods will be found. But I have supplier files separately, that tell me exactly who we are purchasing from, and how much. When I have time I try to analyse how much business we are doing with each. That way, when we review our supply contracts, we have a negotiating position to work from.

Sounds good, and it sounds like a little automation would help!

Quite so. I look forward to that, but I won't hold my breath ...

Information analysis – interview with the Sales clerk

Discussion of the entity/information example

Look at the information model below. The clarity of Susan's thinking shows through! No confusion there, and again this is typical of what one will find in real cases. She quickly describes what is termed a 'normal invoice' and when analysed the result will be something like the model given on this page. Note

the symbols used this time – they are different from those used in the data flow model.
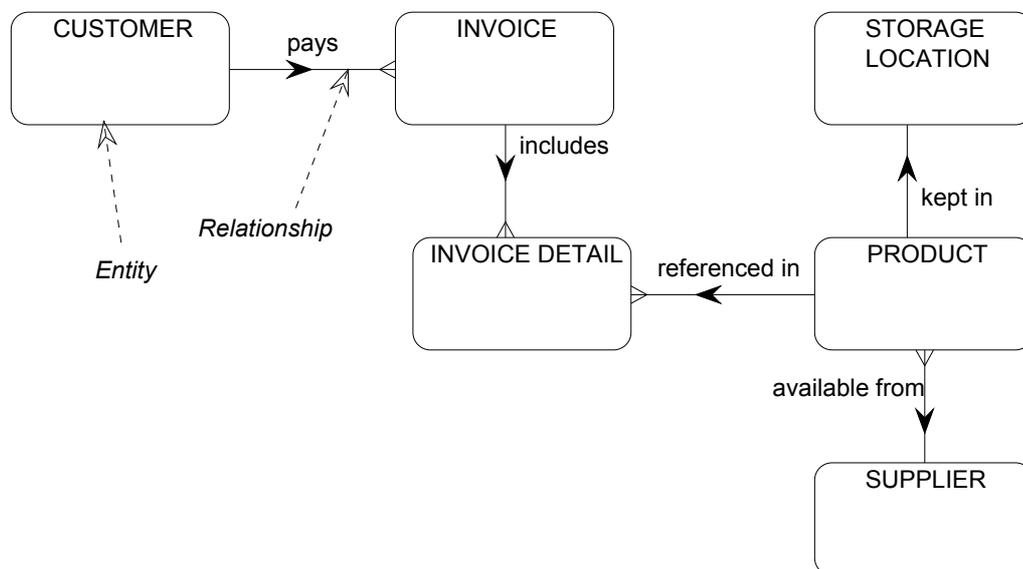
- The rectangles now represent the entities about which information is kept: customers, products, invoices and the rest. In each case, there will be a variety of information that is required, for example names and addresses, dates, product codes and the like.
- The connections between the entities are *not* flows they are *relationships*. They show that the one entity is *related* to another through the words adjoining the relationship line. Note that the relationships have a '"crow's foot" that indicates multiplicity: a *customer* pays many *invoices*; an *invoice* has many *invoice details*; a *supplier* supplies many *products*. Here we begin to see the structure of the information that will be invested in a database, and the relationships show how it will be possible to navigate through the information contained therein.

These information-related models can be developed in two ways. Firstly, from the bottom upwards, by the minute inspection of operational documents and reports. This is a tortuous process that can consume many man-years of effort and if the purpose is to find new business ideas, it is not generally productive.

Second, from the top down, by asking senior management to talk about the key entities within their business about which they want to have information. This can be a very rapid process and (if there is no model already evident) it can be best done by brainstorming. In just a few minutes a meeting can get a good grip on the most unusual ideas, given good facilitation. This approach is most useful when we are looking for new ideas rather than for simple operational improvements.

An entity model tells us little about the way a business works, but a lot about the foundations upon which it is built. The essential definition of an entity is: 'any thing about which we may wish to keep information'. In the entity model all these things are seen in the same way *but they may represent quite different kinds of 'thing'*: people (customer, employee), organisations (operating company, regulatory body), product (stock item, non-stock item), locations (shelf, head office), moments in time (approval, sale), or even completely abstract notions (project, idea). This ability to render such disparate things equal in information terms is the main strength of the entity model, because it helps us to break the mould of conventional thinking. Instead of arguing the case for a new system for the financial controller, or for the Scandinavian warehouse, we can see the system for what it really is: a means of manipulating information in support of business processes which may transcend departmental and geographical boundaries. For the same reason – that it is able to render completely different things equivalent – it is a difficult technique for some people to accept and understand.

An important property of an entity model is that it reduces our vision of the business to just one page of paper (albeit larger than A4 in some cases!). Even for the most complex businesses it is possible to accommodate a complete view of it on a single page. Process and activity models require many pages, leading to all the consequent problems of understanding and checking of details.

Relating business analysis to the portfolio

So, we find that there are different ways to describe an information system idea, and we might wonder what is the most appropriate approach in a particular case. The applications portfolio comes to our assistance.

Full analysis of a business requirement is easiest with key operational systems. Here we are working with ideas that are understood, working for us, and probably common across our industry. Without a suitable suite of key operational applications we would probably not be a viable industry player. It follows that here we may well want to acquire a software package: why should we start from scratch when others have gone before us, and when concepts of good practice are in place? Business models in this situation would be a way for a supplier to explain what is on offer, so that we can match it to our detailed requirements. There will be a strong bias to process models, because we will want to know how the new system will impact on current procedures.

Analysis is more difficult for strategic systems. There is an idea, but it is not a familiar one. The business community that wants the system is interested, but they cannot explain what their requirements are. Experience suggests that the deeper insight that comes from entity modelling is more appropriate here. The fact that at the level of information requirements the whole of the business can be reduced to one page is very powerful. It is easier to identify and organise

entities and collect process ideas around them, than to specify the process and then decide what information is needed. The introduction of Customer Relationship Management is a good example: by introducing the customer as the central design feature of the business we immediately adopt an entity perspective. What we need to do for customers may not be immediately clear, but the information that we can choose to keep about them (and their orders, their enquiries, and their buying habits) is very clear indeed.

Horses for courses

What we learn from the applications portfolio is that there cannot be and must not be a *singular* view of the way we manage information systems. It is essential that there is managerial flexibility, so that the profile of each system implementation project and its management can be specified individually, with appropriate tools and technical skills and with the right degree of user involvement.

The typical business does not always see it this way, but those organisations that have invested in learning about information systems management using the applications portfolio have universally welcomed it for the way that it makes the differences between different information systems clear. Consider some of the options.

Buying a package

It is quite common to argue that it would be better to acquire a package than to build a bespoke system "in house", but the argument will flounder without some appreciation of the portfolio. For example, there are no packages that deliver high potential systems – this quadrant is the seedbed of new thinking that originates entirely new ideas. However, support systems should almost always be acquired as packages, because there is no purpose in developing yet another unique solution to a widely recognised and already-solved problem.

The case of a key operational or strategic information system is not so clear. In recent years there has been a very strong move towards packages, ever more complex and ever more capable, and ever more likely to provide for all key operational needs. However, many organisations will feel strongly that some aspect or another of their work is unique and not amenable to standard solutions, and so the dangerous game of adapting standard packages begins – this is not a good idea for the faint-hearted. On the other hand, there is *some* strategic potential in the deployment of a large and complex package, especially if competitors have floundered in the effort to get it up and running and the opportunity exists to be the *only* business that has successfully gained the benefits of such a large package. Take the "Enterprise Resource Planning" package. Of all the SAP implementations that have been analysed, the majority have been found to have some degree of significant difficulty. Hence, the successful implementation of SAP (and the successful adaptation of the

business to work with it) will deliver considerable competitive advantage through cost reduction, improved management information, and increased efficiency of working. There are many reports that SAP has increased costs, impeded the flow of management information and reduced the efficiency of working, but these are likely to be cases where there was no willingness to manage the changes with the necessary clarity and vigour. There is an unhappy tendency to rely on the use of consultants in these situations, and that is not always a good way for management to declare their commitment to the idea of change.

One interesting consequence of a decision to acquire a package is that third parties are introduced – the package supplier.   Now we have not just the IT department (in whatever form it might take) and the business at large, we have the package supplier as well. Worse, the relationship with the package supplier is likely to be managed through a contract that must be drafted and approved, and which will include quality controls, service level agreements, deliverables, progress reporting procedures, and even penalties. Who is best placed to manage a contract like that? Not the IT department, in all probability.

Outsourcing

As we learn to work with third parties at the relatively simple level of software packages, the rather more ambitious idea emerges that we can contract out whole areas of our activity, wholesale (so to speak). As organisations decided to focus more and more on strategic aspects of their work, it seemed more and more appropriate to let the mundane work go out to external specialists who could deliver the advantages of economy of scale and particular knowledge about the activity in question. We refer to this approach as "outsourcing" – a client organisation outsources a part of its operations to an "outsourcing services provider".

In one case, BP (British Petroleum) took one whole part of its global operation and outsourced the accounting operation. Staff working in this part of BP had to pass all accounting activity to a third party that then dealt with things on behalf of BP. Seems like a risky idea? At the time of writing the jury is still out on this one. In another case, the Co-operative Bank (one of the smaller banks in the UK) outsourced nearly everything: cheque handling, ATM operations (including cash handling), credit card services and even information technology. All IT operations were outsourced to a single outsourcing services provider. So, you might ask, what was left? They would answer "customer relationship management". This is an extreme case, but for a small bank we have to admire the courage involved in deciding to put virtually all key operational activities out on contract, leaving only the most strategic area of activity – customer relationship management – within their direct control. No organisation would wish to outsource critical strategic operations of any kind, but it makes a good deal of sense to outsource non-critical maintenance and

support work. With appropriate trust and reliability in the partnership, it is clearly possible to go a great deal further.

There are now many outsourcing service providers who can, if managed intelligently, undoubtedly help a business to improve the quality of operations. The detailed reasons for outsourcing will vary from one case to another, but would typically include:

- Reduction in operational costs
- Access to scarce specialist skills
- Improvement in reliability of service
- Deployment of the latest technologies with real economies of scale

Of course, outsourcing presents its own risks.

Supposing you have negotiated a seven-year outsourcing deal, and then suddenly the time is up. You no longer have any internal staff who understand critical details of your information systems operations, you want to make a move to a different outsourcing services provider, and you suddenly realise that the one provider – the new one – will have to rely on whatever the other will do to help. But this other is the old one, they have just lost your business, and you are expecting them to co-operate with another party that is a competitor – what do you think is going to happen then? The best that you can hope for might be to make a completely fresh start, but does that fit well with other aspects of your business strategy?

There are more obvious risks to outsourcing that might already have come to your mind. For example, your chosen service provider might fail. They, after all, are taking up many of the risks that you would otherwise have to carry yourself. Their key staff might relocate elsewhere, where they could inform your competitors about critical aspects of your plans and strategic activities.

Clearly it is once again a question of balance and risk management. These things cannot be left to the IT management alone.

IS/IT Partnerships

There is one more possibility that has found some currency amongst progressive organisations. Beyond software packages, beyond outsourcing, there is the possibility of *partnering* with an external organisation, where the synergies are good and where the combination of the capabilities of both promises to deliver large scale strategic benefits.

One consulting company has organised its thoughts about partnerships and relationships at three convenient levels, that help us to get started:

- First, there can be a *transactional* relationship, where one party provides services to the other and charges for them: this is more or less at the level of outsourcing as discussed above, where fees will normally be a combination of fixed periodic payments and additional fees for extra services where needed.

- Then, there are *partnership* relationships, where two (or more?) parties decide to work together in a single project (probably a large one, of course) in a way that allocates responsibility for the different tasks within the project according to the skills and competencies of each: this will never be easy in the first instance, but where there is a track record and where there is enough clarity about what must be done to enable sensible work plans to be put in place, then this is an option that should be seriously considered.

- Finally, there can be a *risk and profit sharing* relationship, where the unknown is acknowledged and where managements agree to invest despite the risk in a way that spreads it between those involved; should there be a profit (and usually there will be some optimism about this, of course!) then that will also be shared.

There are examples of partnerships around us, and there is evidence that they are not always easy. Even if managements on several sides agree that the idea is a good one, shareholders can upset things by refusing to support some of the more adventurous ideas. As soon as shareholders realise that there are real risks, possibly because the risks are evident elsewhere (and which shareholder does not watch market conditions carefully?) they will not wish to be exposed within their own portfolio of investments.

We have moved a long way from simple thoughts about information systems. We are touching on much wider issues that need to be revisited elsewhere, particularly in the area of business strategy. Although business strategy is not solely concerned with information technology and information systems, it has to embrace the problems and opportunities arising there from, and we must return to this interesting discussion later when we have laid out more of the groundwork.

Managerial issues in Information Systems

It should be clear from the above discussion that there are many issues that managers face in dealing with information systems. Even if information *technology* has become commoditised as some experts are now arguing, this does not help us to deal with the many problems and opportunities that present themselves at the level of information systems. If you look critically at a selection of typical businesses or organisations of any kind, then you will almost certainly find a majority that are stuck with 1960s and 1970s thinking, that have no understanding of the strategic potential of good information systems, and certainly have no managerial processes that encourage staff at all levels to come forward with ideas.

This is the critical issue: if an organisation wants to be progressive with its use of technology and systems, then how is it to become so? We now have some of the clues before us; time will tell us what else we must learn if we are to make the best use of the multifarious opportunities that sit just around the corner.

In summary, here are some of the managerial issues that we must deal with:

- **System development capability:** Although much can be achieved with software packages, any organisation wishing to be progressive will need the capability to develop its own systems with its own resources. The nature of technology continues to change and many larger organisations are now handicapped by the staid thinking of their IT departments; it is time for them to hire some new staff who will be able to take up the challenge of working with the new technologies – especially with web technologies that are radically different from what we have been using over the last thirty or forty years. Despite these changes however, the ability to specify requirements by some means or another remains a critical issue. Information systems will continue to be fragmented and diverse until we learn to scope them and specify them well, in relation to the needs of business units at different levels.

- **Relationship management:** The relationship between information systems specialists and the organisation at large needs to be carefully nurtured. It is too easy to devolve responsibility to a low level and to allow chasms of misunderstanding to develop. An organisation that has managed to bring the two parties together through sharing of ideas and ambitions is an organisation to be envied.

- **Investment justification:** Often the problems start right at the beginning, when a decision is made to invest in a new system without proper consideration of *all* of the consequences, especially in terms of the benefits that are to be expected and allocation of responsibility for delivering them. A decision to invest must be supported by a proper justification.

- **Benefits management:** The different kinds of benefit arising from different kinds of system must be understood, and then systems must be managed appropriately, especially in their early days when they are conceptualised and realised by one means or another. There needs to be an effective way to categorise information systems according to their contribution to organisational strategy, and by other means.

- **Performance management:** At the end of the day, the benefits of information systems are seen through the improved performance of the business. Without performance management that makes these improvements visible, the delivery of benefits will always be uncertain. And, it is interesting to note that business performance management is itself a matter of information systems delivery: without management information systems that evidence performance the situation will be hopeless.

- **Encouraging new thinking:** Any organisation that wishes to be progressive (a leader, not a lagger) needs to ensure that there are procedures that facilitate the development of new ideas and then that prioritise them and manage the allocation of resources and funds. Further, such an organisation needs to have a culture for learning that will accept

(and even encourage) failure, for the reason that there is so much to be learnt from the ideas that do *not* work. Whilst there will always be something to be learnt from watching others, the best strategic opportunities will come from within and from the accumulation of internal experience and learning.

We have looked at the nature of information systems and we have exercised the idea that the maturity of an information systems idea is a critical one to understand. Through the 3x3 "evolutionary" matrix, and the 2x2 "applications portfolio", we can see trends in information systems thinking over decades (in the first case) and then the trends within a single organisation over shorter periods of time – months or years (in the second).   The applications portfolio is a particularly popular and effective tool to use, and we shall be visiting its details again before we are through with the IMBOK.

Deciding how to reconcile the managerial approach to information systems with the applications portfolio is no trivial task, but the general nature of what can be done should now be clearer. When everything comes together properly, the results of good information systems management can be spectacular. The important message is that it is not appropriate to treat all information systems in the same way. The incorporation of different analysis and development tools and the judicious use of software packages are indicative of the decisions that will have to be made. Where bespoke systems are critical to organisational success, sound information systems engineering methods and tools are needed; where reliance is placed with external parties, as in the case of software packages and partnerships, then contract management skills will be needed; where systems are not critical, a more casual approach may be in order.

Knowledge area 3: Business processes

Definition of Business Process

> *A business process is a logical envelope that co-ordinates and gives purpose to business activities; generally where an activity delivers an* output*, a process delivers an* outcome *– a result that is evident to stakeholders outside the business as well as those within.*

Of all the concepts that we are exercising here the business process is, for some people, the most difficult to embrace. We are all familiar with where we fit into the organisation from the point of view of the organisation chart, but when it comes to seeing our work in the context of the total effort that our employing organisation undertakes we have great difficulty. We all know who we work for, but we are not clear how our contribution combines with the work of others to deliver an outcome to the outside world.

There is a useful distinction that is evident in the definition above: "*activity*" is a word we shall reserve for the lower levels of what we do; "process" is a word that we use for the higher-level view. Thus, "customer order fulfilment" and "acquire new customers " are very high level views of what goes on, that would typically qualify as processes. "Check customer credit line" is clearly a much lower component of customer order fulfilment that combines with an unknown number of other activities to deliver what the customer wants. The customer (as an external stakeholder) is not interested in credit management only in getting their orders delivered. Until, of course, credit management comes to the result that we refuse do to do business with a particular customer … then we will find ourselves in a different process, something to do with "manage customer relations" perhaps?

Two observations follow from this, and can usefully be kept in mind:

- A *business process* is a high level component of a business that is comprised of a number of lower level business activities; it delivers value to organisational stakeholders.
- A *business activity* is a low level component of a business that makes up a part of a business process; it consumes resources and drives up costs.

This establishes the idea of a hierarchy, and cautions us about the volume of detail that we might have to deal with. A business may see itself as having only five or six business processes, but it might have thousands of activities. Set an analyst to work to find and document all the activities, and they will be lost for

ever. Set a management team to deliberate and decide on high level processes, and we can get a grip on things.

Nature of Business Processes

It is some ten years since the world of business management first became excited about "business process re-engineering". For some time, experts argued about the differences between "re-engineering" and "re-design", and huge sums of money were earned by consulting companies that deployed "methodologies" for achieving "BPR", whatever that might have meant from one moment to the next. Much of this thinking has since been discredited. Once the target of excessive "hype", interest in business process management arose rapidly but then faded as the early excitement gave way to difficulty in making ideas about business process management work. The majority of organisations that toyed with business process ideas gave up and reverted to conventional thinking.

However, the idea of the business process is still very important and out of the experiences of those few organisations that succeeded with it, we now understand more about how to deploy process thinking to our advantage. A lot of the ideas about processes come from thinking about systems, and for some people business process management is an extension of systems thinking and systems practice.

Processes and the organisation chart

Let us reflect again on the organisation chart that is, for many of us, the most familiar overview of what a business is.

Commonly the organisation chart (or organogram) connects one part of the

The organisation Chart

Business processes cut across the organisation chart
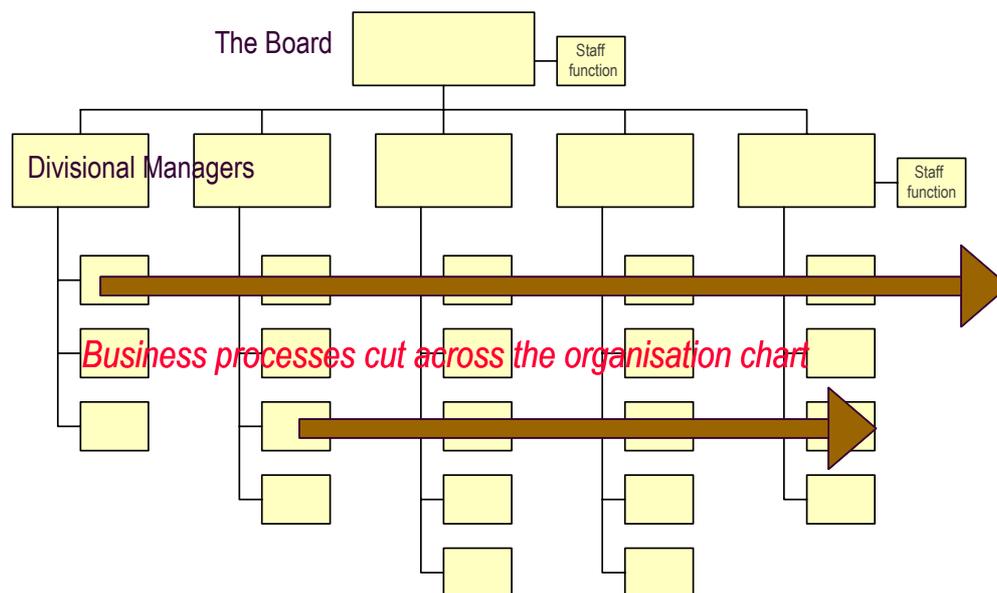
organisation to another, and may indicate in each case who is managing each part (see the figure, which shows a simple representation of an organisation chart). The connective lines in an organisation chart therefore tell us "who reports to whom" but not *what* people do. If you are ever offered an organisation chart on the basis that it will tell you who does what, be careful. It does not necessarily do anything of the sort. You have to go and talk to people to find out what they actually do.

A business process delivers something useful to the outside world, as we have noted. But it does this by calling on a range of organisational components such as the sales office, technical support, production, engineering, quality management, and so on. A business process is therefore the sum of all the effort that goes into delivery of the outcome, wherever the effort might have come from. People working in organisations that acknowledge and manage processes therefore have two concerns: firstly who they work for (and which functional area of the business they are in), and second what their contribution is to the processes that they are involved with. This is how people become confused. As soon as there are two lines of reporting – one to the departmental manager and one to a process manager, there is the potential for conflict and disagreement. Another case of difficulty for the faint hearted. Firm and clear management policies are required to avoid the stress of many lines of involvement and reporting.

Identifying business processes

So far so good – we have an understanding of what a business process might be, and where some of the problems lie. The question arises: where do business processes come from, and who defines them? It is amusing to look back at some of the very early writings about business processes, from the early 1990s, where there was a presumption that an organisation could "set to and work out what your core processes are" without any more detailed guidance. What if an organisation was uncomfortable with what it was doing and wanted to find a completely fresh start? What if it was looking for a new core idea, that would "break moulds" and "get out of the box"? Some of the early thinking was very lightweight and laid far too much emphasis on radical change without taking account of the timidity of the typical management team. Radical change is extremely difficult to deliver, and we have long since reconciled ourselves to the understanding that business process related change must be done with a degree of care and with due attention to detail. It starts with the question: "*what is our vision and mission, and what have we set out to do?*"

In the context of change and uncertainty that faces businesses today, it is important to be able to develop and agree a clear understanding of what a business sets out to achieve at a high level. Mission, vision, and all that good stuff. From the high level of the corporate vision, which provides a rationale

and a general direction, down to the definition of operational activities, an organisation needs to be able to understand what is to be done and how it is to be done. Based on an understanding of what *stakeholders* expect from an organisation we can derive idealised process sets, and then get to work on the difference between what we *are* doing and what we *should* be doing.

The value chain as an early indicator of process thinking

Let us remember that we are striving to establish where and how we should invest in information systems through the improvement of existing systems, or through the introduction of new ones. History tells us that it is just too easy to take a blinkered view of needs, to confine our arguments to one particular part of the business, and to fail to recognise the benefits of a broader view of things. One of the early tools that was used to explore information systems opportunities that still works well for many people is the value chain originally promoted in the early and middle 1980s by Michael Porter (See for example Porter & Millar, 1985).

Some experts now discount the value chain on the grounds that it is old thinking, but there are others who will argue otherwise. One view is that while it works, we should continue to use it. Here it works because it gives us a tool that liberates us from thinking solely in terms of the organisation chart. Porter
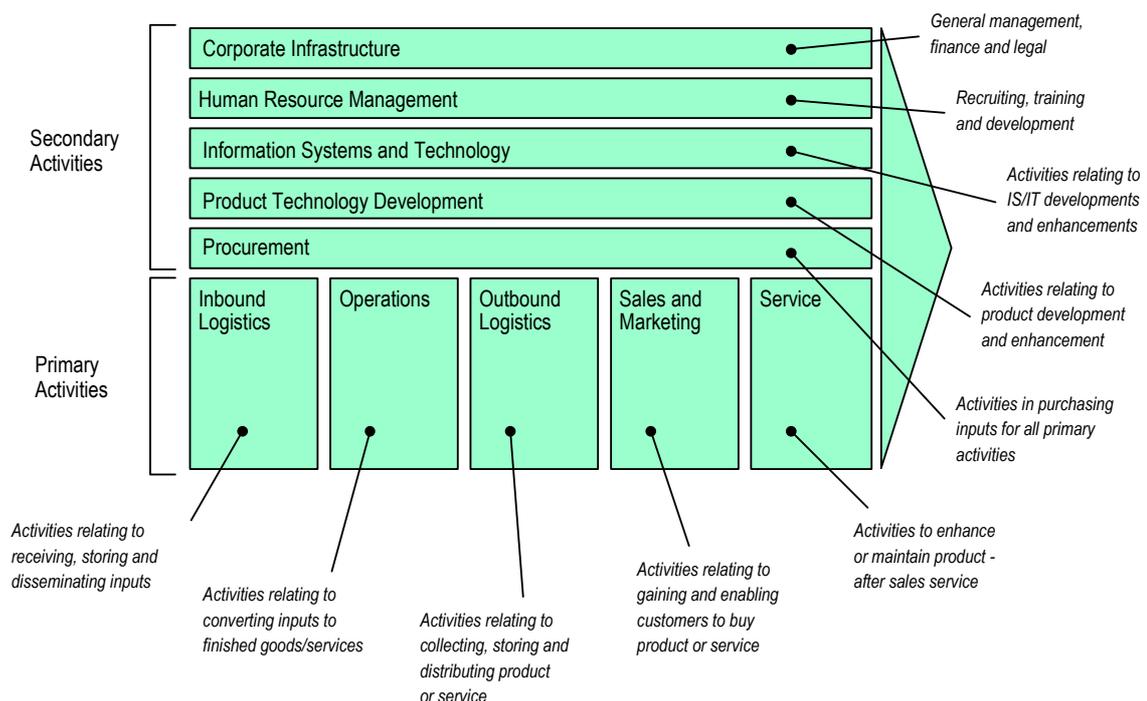
promoted it as a way of seeing the differential between cost and revenue (and therefore the accumulation of profit) but here we can use it to see how a business works to create value, and where some of the cost drivers are.

The internal value chain shows how the various activities and functions in a business unit contribute to the customer's requirements, and how costs are incurred in so doing. Understanding what is done, how it is done and how

business activities are related leads to a better understanding of information and systems needs and opportunities. The value chain helps to get beyond the detail of current arrangements in order to see the bigger picture in relation to the whole business and (most importantly) the way that customers see it. The original value chain model was based primarily on manufacturing business, but its structure can be applied to most other types of business. The model identifies two different types of business activity - *primary* and *support* - and provides a framework for organising the detail within them.

The figure presented here shows a typical view of the value chain structure, with comments appended concerning each of its ten components. The value chain is discussed in more detail elsewhere (See "Strategic analysis tools").

Business process redesign

The value chain gives us an early indication of process thinking by focusing on the five stages of a process that delivers value to customer and the five generic layers of supporting activity that facilitate it. Although it was targeted at manufacturing business it is possible, with adaptation, to apply it to a wide variety of business situations[3]. However, we must always remind ourselves that it is based on concern for the *customer*. Then, we must ask who else has a view about our business that might affect how we work the business. Is the customer the only stakeholder? No, there are many.

It follows that we need a more general approach to the design of a business as it might be seen through its processes. The value chain provides a generic process to meet customers' expectations, but what about the shareholder? What about suppliers? What about employees? Typically there will be some ten or more stakeholder groups each of which must be served in an appropriate way. Hence, we must seek out an analytical approach that will deal with all stakeholders, and take some account of their relative importance. It is interesting to note how, in recent years, the privatisation of the telecommunications industry has taken the eye of telecommunications management off the customer, and put it firmly on the shareholder. There are other examples where the interests of customers were subjugated in favour of others.

Partly as an evolution of systems thinking, and partly as a result of the total quality management experience, many progressive businesses took up the idea that business processes can be *radically* redesigned. The argument is that business processes are more an accident of history than conscious planning and there must therefore be significant benefits to be gained from a rationalisation and reorganisation of processes.

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[3] In the author's experience it has even been applied to an analysis of committee work with a group of senior civil servants and then led to revelations about how information technology could make committee activities very much more effective.

The depth and scope of change

An age-old question concerns the willingness of organisations to change. We can point to industries where change was very painful but prevailed in the end. For example, the banking and insurance industries were well set in their habits, and invested very heavily in what we now call legacy systems in the 1970s and

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first direct: a business process redesign success story

Before the World Wide Web, before liberation of the telecommunications industry, and before the dramatic expansion of retailer services to include banking, a young man joined the Midland Bank in London and began to promote the idea of a telephone banking service. This does not seem surprising today but at that time, when we all expected to walk into the bank and spend time in queues for any non-trivial operation (such as one could not do at an automatic teller machine, the most recent banking innovation at that time), it was a dramatically different idea. For three years he argued his case, until he was finally given approval to launch a new telephone-based bank, with a completely new brand. In fact, the affiliation to the Midland Bank was written so small on all the marketing literature that you would have been hard pressed to spot it, indicating perhaps that when the whole idea went pear-shaped the reputation of the host bank would not be too badly affected.

The young man in question found premises, hired a similarly young and unfettered management team, and set about the task. Although the new bank, first direct, used the same back-office systems as Midland, a completely new front end was built so that specially trained banking assistants could undertake virtually any transaction on behalf of a customer, on the telephone, driving the business along. Service quality was the target. At the time it was amusing to hear the young man say: "I went to a place where they understood service and taught them banking" (Leeds in Yorkshire, as it happens) "this was much easier than teaching the bank about service". The new bank was launched in only ten months. Within a further eighteen months first direct was servicing almost half a million accounts with just over one thousand staff – an extraordinary achievement by any measure.

1980s, only to find that others, more fleet of foot and more imaginative of thought, were able to move in and usurp their market dominance.

An excellent example that is worth recounting briefly here is the "**first direct**" banking operation in the United Kingdom (the emboldening and absence of capitalisation in their name was their choice, it is not a typographical error).

first direct is an excellent example of success, but it raises two issues that need to be appreciated by anyone considering their own chances of radical business redesign.

- First, what depth of change can be tolerated? Is the organisation in a condition to put up with deep-seated change? For **first direct** the change was deep because it involved a change to telephone banking, 24 hour operation, and a completely new approach to customer relations. This challenge was met by the creation of a completely new bank with completely new personnel.

- Second, what scope or breadth of change can we tolerate? Are we trying to change everything that we do, for all our customers? Are we to change all our business activities and reconstruct all processes, or just some?

These are different issues, because it is much easier to deal with deep change with a narrow scope, or mild change with a broad scope than to change the world. In the case of **first direct**, the depth was dealt with by creating an new organisation. The scope was limited to what we would now refer to as "front end services".

Depth of change

There are three levels at which we can approach business processes:

- First, we can simply take stock of business activity generally, because we wish to optimise operational costs on a more informed basis. Should we find that any activities are particularly inefficient or time consuming, we can explore the application of information technology to their improvement.

This level we can reasonably refer to as "business process improvement", because we are not trying to redesign or radically change anything. We are just trying to make things work a little better. Most pundits would exclude this level from any definition of BPR.

- Second, we can look at the business more carefully, not just to identify efficiency but the way that activities combine into business processes that are visible in some way to the outside world (to customers and suppliers, as well as other business partners such as banks and transportation service providers). In order to gain significant benefits we further decide to look at the bigger picture and go for wholesale change: elimination of redundant activities, redeployment of inventory, close sharing of information with partners. This significantly changes the way the business works, and also the way that our business partners work.

This is one view of what most people regard as "business process redesign". We are looking for an overall 80% improvement, not just 10% here and 20% there.

- Third, at the most extreme level, we can try to find completely new business process models from a clean sheet. This has been rarely referred to in the BPR literature but it is increasingly evident in practice. For example, a public sector organisation that is asked to go 'private' needs to ignore all current thinking about process because it will be bureaucratic and wholly inappropriate to the commercial model that they seek. The challenge is to find a new process model from first principles. The relatively few web-based businesses that succeeded did so because they completely redefined the way a particular business should work.

This is pure "business process invention", although this is not yet a term that has been widely used. It raises the question: if we have no business, or we

wish to completely redefine our business, how shall we begin? We will attend to that question shortly.

Inevitably any real case will be something of a mixture of these three levels of approach. Some actions will be as simple as automating current operations more efficiently; some will involve redesign of business interfaces for more effective operation, and some will demand completely new thinking.

Scope of change
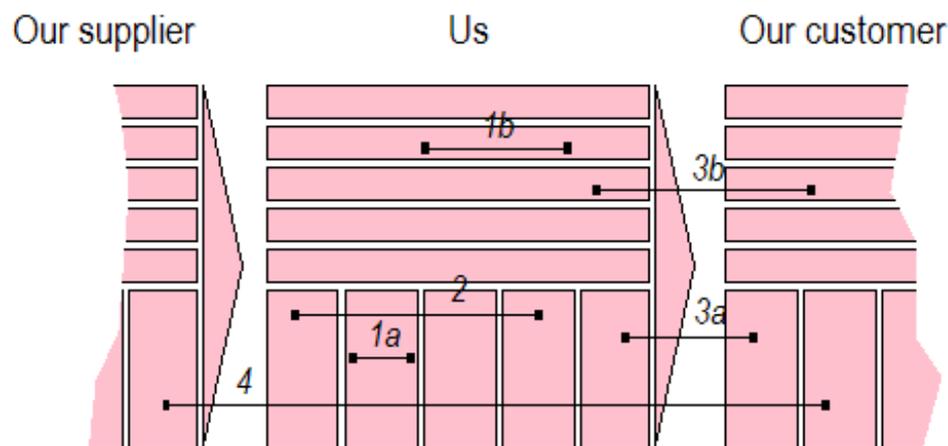
1   Local redesign (a: primary; b: support)
2   Internal redesign
3   Interface redesign (a: primary; b: support)
4   Industry network redesign

As well as the depth of change we must decide the scope of change. Are we dealing with one department, with a whole business unit, or with a complete industry? We can define scope of change at the different levels of: local redesign, internal redesign, interface redesign and industry network redesign. The value chain can come to our assistance here. Look at the figure below, which uses the value chain to illustrate how a chain of businesses work together:

- **Case 1** is where we are redesigning within a single functional area of our business, either in the value-adding stream (1a) or in the supporting activities (1b). This might be an improvement to a production scheduling system or a new financial management package. *No problem here: change is confined to a single area of management responsibility.*

- **Case 2** is where we are straddling different functional areas of the business in order to achieve improved information flow and tighter integration of

activities. This might be a workflow management system or an integrated stock management system. *This gets more difficult. We are touching the domain of control of different managers and we will have to persuade each of them that it is in their interests to co-operate.*

- **Case 3** is where we set out to build links with external parties, in this case with our customer. It might be that we are proposing EDI linking or that they have asked us to participate in their new procurement management system. *This also gets difficult but for different reasons. The strategic significance of an idea like procurement management is different for each of the parties. The timescales involved in external partnerships can be considerably extended, and not all partners will pull with the same enthusiasm.*

- **Case 4** is the most challenging, because our customers and our suppliers have decided to get together and exclude our business altogether from the chain of industry activity. The term that is used to describe this is "disintermediation". *This is the ultimate challenge and requires us to seriously reflect on the contribution that we make to our industry. Agents, distributors and factoring businesses all around the world are in exactly this situation, whether they are in travel, motor spares, or any other area where they used to be needed because they had a grip on local demand and sole access to local customers, for example. As is now very evident, these things change.*

Principles of BPR

The principles of BPR were established in the early literature as follows:

- **Organise around outcomes, not tasks:** process models out of information analysis let us see more clearly what the outcome is, and how it is derived.

- **Have those who use the output perform the process:** well designed information systems can integrate the overall process and - in effect - enable the ultimate users of the output to initiate the production of the outputs themselves.

- **Subsume information processing into the real work:** there is no need to have a separate operation to achieve information processing - technology makes it possible for a workstation to be provided at the point where the real work is done, providing seamless access to all of the information and processing capability that is required.

- **Treat dispersed resources as centralised:** networking technologies make it trivially simple to locate information workers anywhere, while maintaining central control.

- **Link parallel activities:** Very often there is duplication of activity; information analysis reveals this duplication and - by understanding the underlying information structure - makes it possible to eliminate it or reduce it.

- **Put the decision point where the work is performed:** too often work flow is interrupted so that approval can be given by a more senior authority; by making the basis for the decision clear and by making all the requisite information available the decision point can be removed to the point where the real work is being done.
- **Capture information only once, at source:** the level of duplication of information in most organisations is alarming; for example, a national bank had even recently eighteen different places where it kept customers' names and addresses - this can be (and should be) avoided.

The relevance and contribution of information systems to the achievement of business process redesign is quite clear from this set of principles. The tortuous processes that we often find in 'ordinary' businesses derive from the historical difficulty in making information quickly and easily available at any location where it might be needed. This is no longer a problem, and becomes the seed for new ideas about how businesses can operate differently.

Development of Business Processes

Having a process model of a business is important because it sits between the high and low level viewpoints and helps to communicate what is envisioned and what is intended to change. A process model sits comfortably between the new vision (the stimulus to improve a business) and the practical considerations (who does what, and with what resources). Otherwise, how are we to assure the viability and completeness of our vision for the business? Do we have to wait until our ideas are operational in order to find out that they were inadequate? No we do not; better by far to take a methodical approach embracing both the higher and the lower level viewpoints, before we commit to a possibly impractical implementation. We need a model of the business that everybody agrees *is* the business, that everyone can study, understand and work with.

Approaches to business modelling

As we have already seen, there are different ways to model a business. As well as process and information models, the approach to any model can vary from the purely intuitive (done with a whiteboard and relying entirely upon what comes to mind at the time), to a tightly specified analytical method (involving many steps and rules at every stage). Different approaches are to be found enshrined in the proprietary methods offered by consulting companies. Some proprietary methods adopt extreme views, some are incomplete, some are largely ineffective because they are badly conceived, and some are only applicable in specific circumstances.

As experience accumulates within a business it has been found that the most effective approach to strategic business analysis is one which is grown within the organisation; it is necessary to understand certain principles of analysis,

but beyond that the best approach is one which is familiar and which deals with the issues as they are seen. Thus, extreme views are neither appropriate nor necessary: what is necessary is to stimulate thinking. Some degree of structure might be helpful to ensure that random thoughts can be organised and inter-related but it is equally necessary not to constrain thinking and so if there are rules, they should be applied lightly.

There is one approach to business process analysis that embraces both visionary and operational viewpoints and that provides an informal but structured analytical method that enables reconciliation of these different levels of thinking. It is principally a top-down approach to business process analysis, although it has some attributes of a bottom-up approach. It is not intended to be prescriptive, and with familiarity there is no reason why the sequence of steps presented here should not be taken differently to account for different needs. For example, it might be useful to *iterate* the analysis when there is insufficient clarity or certainty about some aspect of the business. Equally, it might be useful to take more or less account of the business *as it is today*, in order to reflect the depth and scope of change that is sought by the organisation.

The two-pronged approach described here works on two fronts:
- What are we to do as a business, and why?
- How are we to do it?

The analysis method is illustrated using the example of a Zoo. At this introductory stage the example is only partially developed in order to avoid a large volume of analysis material. Real-world examples will involve a greater volume of detail than is presented here but the way in which the analytical method works is the same.

The general approach
- **Develop a VISION:** Before we start any detailed analysis it is necessary to identify what the vision of the business is. This is a question for the top management team to address, before the analysis starts. *In so doing we must be clear about the scope of the business that we have in mind: in larger organisations it will be necessary to identify the strategic business unit (SBU) that is to be the basic unit of analysis; in smaller organisations it is possible that the whole of the business can be treated as one.*
- **Determine WHAT must be done:** What is to be done is established by the analysis of stakeholders and their expectations. From the agreed expectations a set of processes is developed which address them, individually or in combination. *The processes will have different significance to the business, one from another. Some will be critical to competitive advantage and others will not. Some may be more important to the future of the organisation than to its current success.*
- **Determine HOW it shall be done:** How the business is to run is established initially by an analysis of those things that the management

team agrees have to be managed. These might be the obvious tangible things (such as buildings or people), or they might be intangible (such as projects or services), but in all cases they are the things that are necessary in order to support the reality of the vision. *Here we will refer to them as the business "components" or business "objects". Each of these components is therefore a target of management attention and will have a lifecycle; it is through the analysis of the lifecycle that business activities are established. Managerial responsibilities for each activity can be noted and measures proposed for assessing how well they are done.*

- **Reconcile activities with processes:** By mapping the activities (from Step 3) into the processes (from Step 2) a view is developed of how the business processes may be operationalised.

- **Assess current performance:** By assessing the current performance of each activity the sum of achieved performance within the containing processes can be analysed and assessed.   Similarly, the sum of achieved performance by management responsibility can be assessed. *These are powerful outputs that give an organisation a very clear indication of the steps that must be taken to achieve process success.*

There are two key results from the analysis. First it produces a clear view of the processes by which the business will achieve the stakeholders' aims and ambitions, and the way in which these processes contribute to the expectations. Second, it produces an understanding of the relationship between activities and processes, and the way in which processes are operationalised by activities. These two linkages are perhaps the most critical for management to understand if they are to create a business that can successfully address the expectations of stakeholders.

(See the figure on the following page for a more detailed view of this approach)

Explanations of terms used:

- **Vision:** An agreed summary of the purpose and direction of the business, including a clear indication of the special attributes of the business that will distinguish it from others of the same kind.

- **Stakeholder:** A type of person (or body of people) that has the power to influence the operation and overall performance of a business.

- **Expectation:** A need or requirement of a stakeholder group that affects perceptions of the success (or failure) achieved by a business and the delight that it creates for stakeholders.

- **Business process:** A logical envelope that co-ordinates and gives purpose to activities. Processes satisfy the expectations of stakeholders. They normally cross the functional boundaries in the organisation.

- **Business object (component):** Any thing of concern to the board, and sufficiently critical to the organisation that it has to be managed. A business object is likely to be resource oriented.

- **Object lifecycle:** The main stages through which a business object transits in its lifetime. Typically (but not necessarily): specification, acquisition, use and disposal. Each stage in the lifecycle indicates the activities that are required to sustain the transition and existence of the object.
- **Business activity:** A mechanism through which the organisation has chosen to operationalise its processes and which uses resources to achieve process goals. Activities add cost to the organisation and they may cross-functional boundaries.

There is sometimes confusion about the differences between "vision" and "mission". A vision is a snap shot that gives a target to aim for, whereas a mission has a much stronger sense of action and will include strong pointers to what must be done. Here we will not refer to mission explicitly although the concept of vision is very important. For those who want to develop a mission statement as well as a vision, it would be best done after the process analysis described here, because the means to achieve the vision will then be much clearer.

Examples of all of the above are provided in the pages that follow.

An analysis method

The figure (below) shows a general scheme of analytical steps that will allow an organisation to work through a process analysis. It is described in more detail in the paragraphs that follow, and the sequence of steps indicated in the figure is followed in the description that follows.

1 - Develop a Vision

A vision statement must be negotiated with the senior management team. Every word in a written vision statement needs to be evaluated - for its meaning and for the contribution that it makes. Later on, the wording and content of the vision statement will be important in weighting and ranking the detail that comes from the analysis.

A good vision statement sets a target to aim at. It makes clear the principal outcome of all the efforts of the business, and qualifies it in a way that makes clear the principal objectives or constraints in achieving that outcome (such as ecological constraints, or the intention to provide exceptional levels of quality in products and services, or not). By having a clear statement of the vision the nuances of organisational capability and competency become clearer, and the specific capabilities the organisation needs to deliver the vision become apparent. A vision is about choices: positioning, scoping and differentiating the business when compared to its peers or its competitors.

Overview of Strategic Process Analysis

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[1] Develop vision  →  [2] Identify stakeholders

[6] Tabulate business objects          [3] Tabulate expectations

[7] Derive business activities          [4] Derive ideal processes

[8] Activity – Process Map             [5] Process - Expectation Map

[9] Business Performance:
    - activities within processes
    - activities by responsibility
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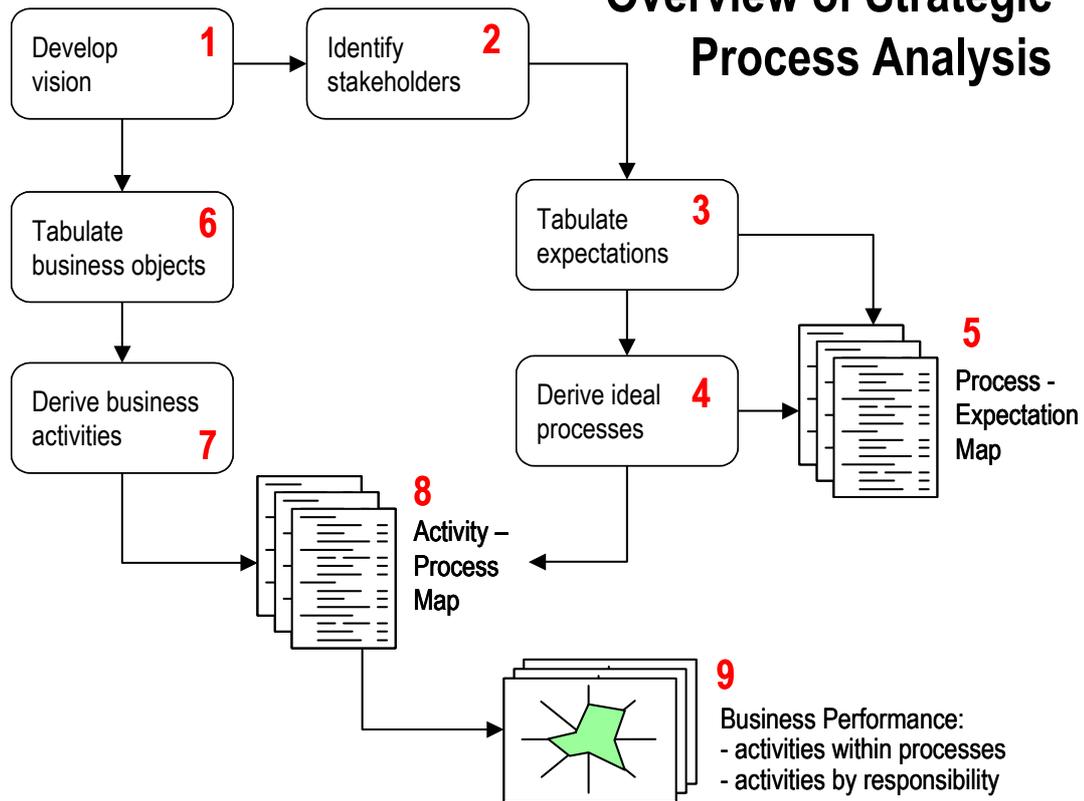
As the vision statement begins to stabilise, highlight the words that define the capabilities required and the key entities with which the business will be concerned. If any are missing, decide what words need to be added to focus on precisely where the organisation chooses to operate, and how it defines and differentiates itself.

You were promised that we would use the example of a zoo. Imagine that this is a private zoo with a new management team that is determined to improve things and deliver to the stakeholders.

Look at the statement from the new Chief Executive Officer of the Zoo, at the right. She is clearly setting lofty targets. At the same time, the Head Keeper (of animals) is determined to maintain a practical viewpoint and to make sure that operational issues are not forgotten.

A suitable vision statement that might come from further discussion between the management team might be:

"I know we need to make a profit but this zoo is going to be guided by proper ethical principles" insisted the new Chief Executive. "I want us to educate and entertain. I want visitors to enjoy themselves with the minimum effort. I want them to have the very best facilities. We'll win by providing really good value for money!"

"Oh yeh?" retorted the Head Keeper. "And who's going to muck out the cages?"

> *The Zoo vision statement:*
>
> We wish to be an **ethical** and **profitable** business, and to provide **educational** and **entertaining** experiences

2 - Identify stakeholders

A stakeholder is any identifiable type of individual or organisation that can influence the course of the business. Stakeholders have differing degrees of importance based upon the extent to which they might apply their influence and the probable consequences of it.

As well as the traditional stakeholders (shareholders, employees, directors), it is necessary to include those that might not be so obvious but which can affect the operation and direction of the business (such as the government, industry regulator, or the local community). The degree to which stakeholders can affect the business will vary and they should be weighted to represent this variation; a process of discussion and agreement must establish the weighting.

Clearly, we are not the zoo and we cannot easily get around a table with the management team of a zoo, but to illustrate the sort of result at this stage, a representative list of stakeholders for the Zoo might be as follows:

ID	Stakeholder	Weighting
S1	VISITORS	70
S2	SHAREHOLDERS	15
S3	GOVERNMENT	5
S4	EMPLOYEES	0
S5	DIRECTORS	0
S6	SUPPLIERS	6
S7	LOCAL COMMUNITY	4
Total weighting:		100

3 – Tabulate stakeholder expectations

Because stakeholders can influence the business to some degree or another, they must be consulted in order to identify and tabulate their expectations. Different stakeholder groups may share the same expectations (for example, both shareholders and directors will expect healthy revenues) but they are also likely to have conflicting hopes and aspirations (such as the employees expectation of high salaries and investments in their skills through training, and

the shareholders expectation of economy in operational matters). Although we might be working with only seven stakeholders (as in this case, although we only illustrate the expectations of three of them in the table below) we can see that at this stage the volume of evidence that we are working with really begins to expand.

An illustration of three of the Zoo stakeholders and their expectations might be as follows:

ID	Stakeholder	Expectations	Weighting	Measure of expectation
S1	VISITORS		70	
	1.1	Safety		Number of injured visitors
	1.2	Entertainment		Length of stay Repeat business
... etc				
S2	SHAREHOLDERS		15	
	2.1	Dividend		Yield versus other investments
	2.2	growth of share value		Growth versus other investments
... etc				
S3	GOVERNMENT		5	
	3.1	ethical operation		Bad publicity Visitor complaints
... etc				

Note that:

- There will usually be more than one expectation per stakeholder
- The same expectations might recur from one stakeholder to the next
- Expectations might be in conflict with one another
- For stakeholders with a zero weighting, it is not really necessary to establish expectations
- For stakeholders with a high weighting, additional care must be taken to establish expectations with confidence
- For each expectation it is necessary to nominate a measure that would indicate the extent of realisation

The question of measures is important, for there is no purpose to an expectation that cannot be measured. As we shall see elsewhere, the means whereby we measure business performance are important, and no measures are more important than those that indicate the delight (or otherwise) delivered to stakeholders. What is the benefit of additional sales in a particular market segment (a low level, activity measure), if we cannot relate that to the expectations of customers (the highest level of measure)? What is the benefit of a lower cost of operation, even across the board, if we cannot relate that to the expectations of shareholders?

At this point we need to look more carefully at the expectations that have emerged from stakeholders. An analysis of seven or so stakeholders, each having four or five expectations, might lead to a list overall of 30 or 40 expectations in total – that would be typical. It is necessary to review the overall list of expectations and rationalise them where they touch upon identical or similar aspects of success. For example, consider the following partial list: that gives more examples than in the table above:

Stakeholder	Expectations
VISITORS	1.1 Safety
	1.2 Entertainment
	1.3 Education
	1.4 Amenities
SHAREHOLDERS	2.1 Dividend
	2.2 Growth of share value
	2.3 Ethical operation
GOVERNMENT	3.1 Safety
	3.2 Ethical operation
	3.3 Conformance to regulations
EMPLOYEES	4.1 Safety
	4.2 Good working conditions
	4.3 Security of future employment
	4.4 Career development

There is evident overlap in these expectations. For example: visitors, government and employees all expect safety. Shareholders and government expect ethical operation. And then, there is potential overlap between the government expectation of conformance to regulations and the employees' expectation of good working conditions. If employees are weighted highly (they are not in the example above, as it happens) then one would want to ensure employee working conditions well above the level required by government; as they are not weighted highly then we would decide to work to the level of government regulations only. This is the way in which our early decisions about vision and weighting affect the more detailed organisation of the analysis such as we have here.

It follows from a rationalisation of expectations that we can put the stakeholders on one side, and simply produce the one consolidated list of all expectations. Note that because employees are not weighted at all (rightly or wrongly – it simple makes a point in this example) all their expectations other than safety, which is shared with others, are eliminated from the list:

Consolidated & ranked expectations
Safety
Ethical operation

| Education |
| Entertainment |
| Amenities |
| Growth of share value |
| Dividend |
| Conformance to regulations |

The final list should be presented in ranked order, taking full account of weightings: the perceived importance of each expectation, the stakeholder group from which it was derived, and the number of stakeholder groups that held that expectation. In the illustration here, we supposing that safety was the most important, and that other expectations were ranked as shown.

4 – Derive list of ideal processes

We are now ready to develop our first list of processes. Because we have established a consolidated list of all expectations, of all stakeholders that we have decided are significant, we now know everything that we must do to succeed, do we not? We even know what is the most important thing to do, to succeed.

Starting with the first expectation, we must ask what kind of process will satisfy the expectation? In the first instance here, we have SAFETY. An appropriate process to ensure safety could be named: "Manage safety", but the word "manage" is one that can be overworked.   What does it mean in this case? Lots of different things come to mind: planning, monitoring, documenting – to mention just three. A better word might be "ENSURE" because it puts the focus on what is required: to ensure that there are no risks and no accidents to visitors or employees.

Hence we arrive at ENSURE SAFETY as the first requisite process.

Note the use of the verb-object construct in naming a process: ENSURE (verb) SAFETY (object). This helps to highlight the fact that we are nominating a process that will do something, hence the use of a transitive verb. It is good practice to follow this convention.

Rules for the creation of new processes:
- For the first expectation, create a process that will satisfy it (as we have done above).
- For subsequent expectations, examine whether they will be satisfied by any of the processes so far established. If so, note it and consider whether the relevant processes need adjustments to the name, or redefinition, or adaptation. If an existing process will not satisfy it then create a new process and add it to the list.
- For any new processes, review their possible contribution to other expectations (already served by an existing process) and note it as needed.

5 – Process-expectation map

In this way we can build up a matrix showing how each of the processes that have been nominated contribute to each of the expectations from the consolidated list. The Zoo processes might look like this:

Expectation / Process	Safety	Ethical operation	Education	Entertainment	Amenities	Growth of share value	Dividend	Conformance to regulations
P1 ENSURE SAFETY	✔		✓		✓	✓		✓
P2 LOOK AFTER ANIMALS		✔				✓		✓
P3 EDUCATE VISITORS	✓	✓	✔			✓		
P4 ENTERTAIN VISITORS		✓		✔		✓		
P5 PROVIDE AMENITIES				✓	✔	✓		✓
P6 MANAGE FINANCES						✔	✔	✓
P7 GOVERN ZOO						✓		✔

- Note how most of the processes contribute to more than one expectation.
- The strength of the contribution could be noted; the strongest contribution in each case is on the diagonal, where the larger check marks are entered.
- Note that all processes are seen as contributing to share value, simply because market perceptions are everything when it comes to investor perceptions of value.
- Note that all except two processes contribute to conformance with government regulations. This is because of the pervasive nature of such regulations.

The final form of such a matrix will not evolve through the use of rules, but rather out of the discussion that must accompany the exercise. It should not be done by one person alone, it should be seen as a vehicle for the whole management team to get a grip on the key issues, and to decide how an idealised set of processes (such as those in the table above) might best serve the interests of stakeholders.

At the end of the day, processes will be assessed by the extent to which they satisfy expectations and the importance of those expectations according to the

mission statement, and according to the weighting originally assigned to each stakeholder. Each process should be thought of as having a distinct outcome that addresses the requirements of stakeholders.

At this stage the analysis has established what kind of business is at hand, who might influence its success, and why we must do what we must do.   This gives us an *idealised* view of the business based on external considerations, but it is not yet complete: we need to think more about how the business will actually work and the practical issues that might affect what we do.

6 – Tabulate business objects

Having identified an idealised set of business processes we need to populate each with the activities (at a lower level) that will "realise" the process. This could be done by brainstorming (by a group of people who ought to know about these things) or by reduction (taking a process and breaking it down into parts, and then breaking those parts into sub-parts, and so on). However, this will not necessarily lead to a workable model for the business because many necessary activities will have only an indirect association with business processes and will not be evident in the "what" view: budgeting and cash flow analysis may be examples, but exactly what activities might fall into this category depends on the business that is under consideration.

We therefore have to find a more comprehensive way to identify activities, both those that are externally significant because they directly support processes and those that only indirectly support them. In order to do this, we go back to the vision statement and derive from it the primary objects that comprise the essential components or elements of the business.

A business object can be seen as any thing that we need to manage: it might be referred to as an entity, or as a component. The challenge (as we have noted elsewhere) is to embrace *all* the things that we need to manage, be they animate (customers, employees), inanimate (product, facility) or abstract (project, problem, objective).   We do this through a simple two-stage process, but unfortunately it is confused by the number of objects that we might have to deal with, and the even greater number of activities that will service them.

With the vision statement to hand, tabulate and organise a list of the high level objects in a business - things that the management team agrees will have to be managed and in themselves define the substance of the business.   This is easily done by brainstorming but with just a few rules for guidance.

- Always name an entity using a noun. For example, "AMENITY", "VISITOR" or "SUPPLIER".
- Stakeholders and the objects already identified in the process names are already candidate objects; it is likely that these will all need managing, but each should be discussed on its merits and given appropriate representation in the tabulation of objects.

- Only include high level objects that represent key components of the business and make clear each one's unique nature and structure; avoid becoming consumed with low-level detail. If it is not something that requires management time, then we can ignore it at this stage.

For the zoo a list of objects would include at least the following …

The Zoo business objects:
Visitor
Supplier
Food
Animal mix
Visit
Cage
Keeper
Facility
Vet

… and with such a list we can get to work on the activities that will support them.

7 - Derive activities using object lifecycle analysis
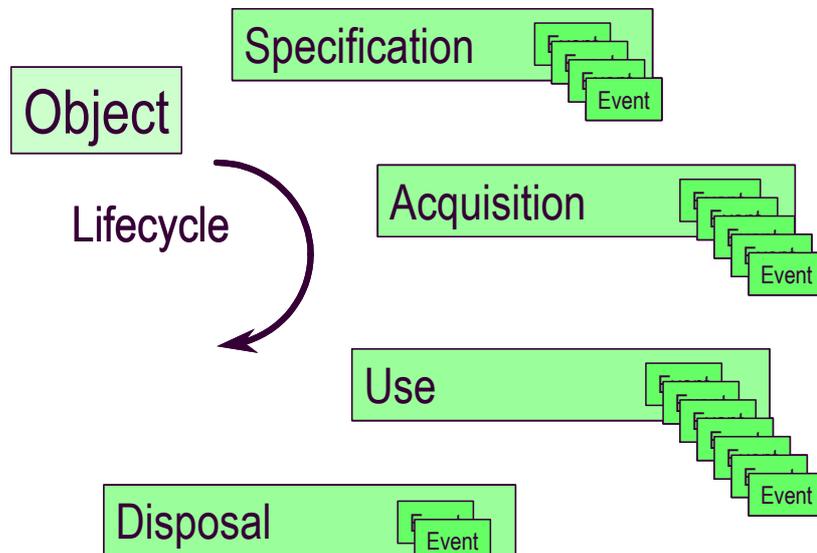
Each object will have a lifecycle. Take suppliers: they have to be selected according to certain criteria and then added to a list. For a period of time, perhaps a long time, they will serve as suppliers to the zoo. However some will fail to perform, or their supplies will be no longer needed, and so we must dispose of them by taking them off the list. Take visitors: they must be persuaded to attend at the zoo, to partake of the activities and facilities, and to come again as often as possible. Sometimes visitors may be deemed to be

undesirable (because of bad behaviour of for other reasons) or they might die, in which case we must take them off the mailing list. In every case, we can quickly establish a lifecycle of involvement with the business objects, and then refine it at our leisure.

In an actual analysis, then, we must discuss and agree the outline of the lifecycle and then tabulate all the activities within each phase. Typically four stages are evident, each containing or involving a number of activities:

- **Specification:** activities to identify requirements, analyse and document them, and then to agree on them before embarking on acquisition.
- **Acquisition:** activities involved in identifying sources, eliciting availability and establishing suitability. Then, actually negotiating terms and taking delivery, thereby concluding the acquisition phase.
- **Use:** all of the activities during the lifetime of usage - possibly many and possibly divided into different kinds of activity.
- **Disposal:** those activities involved in assessing the ongoing usefulness of an object and possibly leading to a decision to dispose of it; all of the steps involved in achieving disposition.

However, the actual stages in the lifecycle of an object might not fit this strict pattern and some interpretation will be required. A partial view of the Zoo activities, derived from lifecycle analysis of just three objects, might be as follows:

Object	Specification phase	Acquisition phase	Use phase	Disposal phase
Visitor	Advertise to the public Liaise with schools Market to previous visitors	Deal with enquiries Provide information about the zoo Take admission moneys	Inform about exhibits Provide refreshment Provide other amenities	Obtain comments about level of satisfaction and future requirements
Supplier	Formulate invitations to tender	Advertise invitations to tender Evaluate tenders Award contracts of supply	Place supplier orders Receive deliveries Check supplier invoices Make supplier payments Monitor supplier performance	Review supplier performance Conclude contract of supply
Food	Analyse animal nutritional requirements Publish feeding schedules	Place internal food orders on zoo food store Collect food from store	Prepare animal feed Fulfil animal feeding	Clean out animal cages and enclosures
Animal mix	*... etc*			

In order to further improve the understanding of activities it might be useful to analyse the ways in which objects interact with each other. For example, how

will visitors to the zoo interact with keepers? If they do (for example by constantly asking for directions) then there is a putative activity: something along the lines of "Direct visitors around the Zoo"). It is possible to do this using a matrix with all objects along the top and down the side. It is only necessary to visit each cell representing the intersection of an entity with another (including itself) and to decide whether or not there is any interaction between them (or with itself) and record it.

8 - Activity–processes map

With a stable view of the idealised processes, and a reasonably complete view of the activities within the business, we are in a position to test the merits of what we do now against what we should be doing. There are two key questions:

- How do the activities from the object lifecycle analysis stack up against the idealised processes? In principle, every activity must contribute to at least one process, otherwise why are we doing it?

- Are our idealised processes adequately populated with activities? It is conceivable that we are simply not doing all the things that we should be doing, in order to serve the needs of our stakeholders.

So, in order to set about this final mapping, we need to develop the activity – process matrix.

As the identification of activities proceeds, examine each for the contribution that it makes to a process, if any. The relationship may be strong, such as "SALES CLERK records the details of CUSTOMER ORDER", which clearly makes a critical contribution to the "FULFIL CUSTOMER ORDERS" process, or it may be less strong. The degree of strength in the relationship can be recorded.

There are a number of possible outcomes:

- **Each process has a proportionate number of activities**. Typically, if there were 8 identified processes and 160 activities, one would expect that each process would have of the order of 20 activities to operationalise it. In the event this may be so, but it is not necessary for processes to share activities in a proportionate way – it depends how complex they are.

- **A process may have no activities, or very few**. Having just a few activities is not necessarily a problem, although management will clearly want to review things to make sure that nothing has been omitted. In the unlikely case that a process has no supporting activities then it is very likely that significant business components have been missed or that the process analysis is flawed.

- **An activity may not be mapped to any process**. Any activity that has no role within a process is redundant and should be considered for elimination.

A selection of zoo activities mapped to processes:

Process	Activities
ENSURE SAFETY	Provide information about the zoo Inform about exhibits ... *etc*
LOOK AFTER ANIMALS	Analyse animal nutritional requirements Publish feeding schedules Place internal food orders on zoo food store Collect food from store Prepare animal feed Fulfil animal feeding Clean out animal cages and enclosures ... etc
ENTERTAIN VISITORS	Advertise to the public Liaise with schools Market to previous visitors Deal with enquiries Take admission moneys Provide refreshment Provide other amenities Obtain comments about level of satisfaction and future requirements ... etc

This map – the matrix of processes and activities – allows us to assess the completeness of the analysis so far. In order to do this the matrix can be used to list against each process the activities that contribute to it; equally, to list the activities and the extent to which they contribute to processes.   From this judgements can be made. In summary, again:

- Does each process have sufficient "support" in the sense that there are activities making a direct contribution to it?

- Does each activity have sufficient "purpose", in that it makes a sufficient contribution to make it worthwhile?

Clearly, the objective of the analysis and modelling effort is to create a better understanding of what is to be done to fulfil the vision of the business, and to make sure that those working in the organisation can see clearly how the vision is to be operationalised, and where things are done well and where things are not done well. And, of course, to see where we need to bolster operations by the use of appropriate information systems.

One possibility is to build separate models for the "now" and "future" forms of the business. Here we have not done that, the illustration being limited to a future model for the business only. However, having created such a detailed

view of what the future business must do it is sensible to assess how evident the required activities are in the current form of the business, and to make a judgement about how well they are done. Even in the case where there is no formal evidence of a new activity (such as "Obtain comments about the level of satisfaction and future requirements" in the Zoo model - because there is no documented feedback mechanism) there will often be some kind of surrogate (Zoo employees hearing comments from visitors may discuss them, and may even report them to management; management might even do something about them from time to time).

9 - Assess business performance

Let us remind ourselves that the purpose of this analysis is to find out where the business might benefit from new information systems. We therefore need to know where we are doing well and where we are not. Hence, the next stage in the analysis is to assess current process performance. Let us suppose for the sake of the discussion that we have a complete set of idealised set of processes and a reasonably complete understanding of business activities. We can assess performance at the level of processes by working upwards from activities. Having mapped activities to processes it is possible to assess the current performance of the business by surveying opinion about how well activities are currently done (if they are done at all) and aggregating these measures under each of the process headings using the process-activity map. If responsibility for activities has also been tabulated (not discussed above, but not difficult to do), it is also possible to aggregate the performance achieved within each area of responsibility.

"Radar charts" have been found to be a convenient means of presenting performance data. In the example below, activities contributing to the "Entertain Visitors" process have been assessed and are charted as the radial axes of the chart. It is immediately evident visually how well one activity is undertaken relative to the others. Here it is immediately evident that the quality of our feedback (from visitors to the zoo) is very poor, although we do deal well with enquiries that come in, advertising is working well, and we are pleased with our amenities. However, we must remember that this is the *internal* view of how well we are doing. We have not based this assessment on what stakeholders think, we have based it on what *we* think. Indeed, the data reveals that we know that we are *very bad* at listening to visitor feedback, so what merit is there in these performance figures? The answer is that we can now take a rational view of the difference between our views of business performance and assess it against evidence of what our stakeholders think. If we can manage the gap between our view and their view, and ensure that the two views are more or less in accord with each other, then we shall be close to achieving the best possible business result.

Assessing the performance
of "Entertain Visitors"
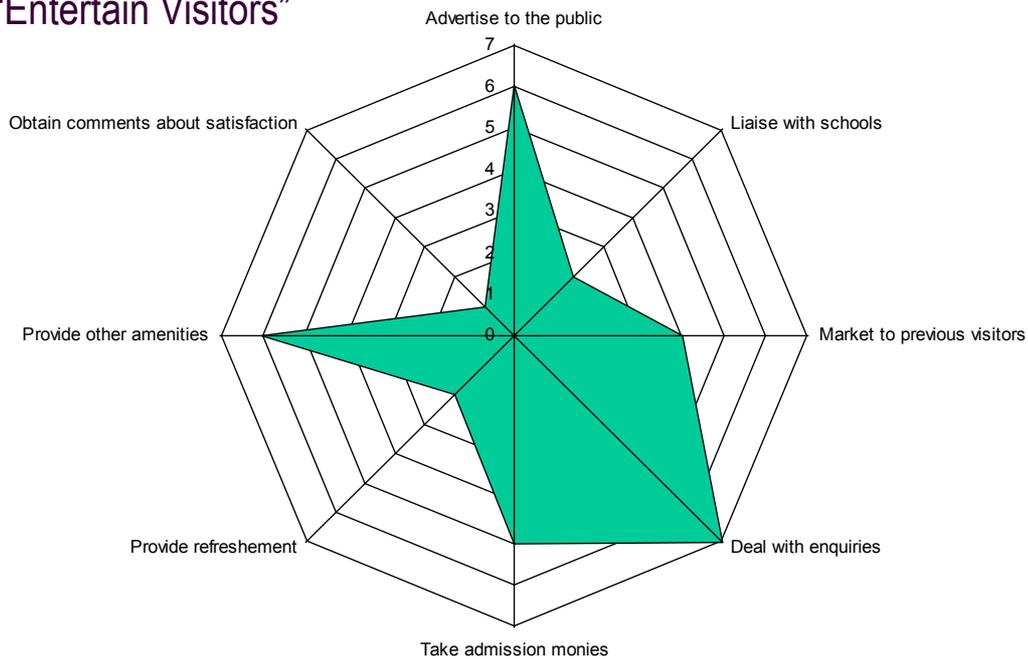
In general the performance of each process will be judged according to the performance of the weakest activity contributing to it, so in the example here we are in bad shape. Then, by comparing one chart with another, the differences in process performance can be assessed from one process to another. This is important, because those processes that are competitive must be done well (significantly better than they are done by competitors) and their associated activities must be monitored carefully to ensure that none of them is underperforming. In the other categories of processes, those that are qualifying must also be done well although the criteria by which they are judged will be different - more operational criteria than strategic (they must be done at least as well as competitors, but not necessarily better than them), and those that are underpinning must be done well enough that they do not cause problems. The transformational processes are critical to the future of the organisation, and so their importance is a function of the need to change, or the desire to change. If there is neither need nor any desire to change then they become less important, but the business will inevitably become less interesting to work in and the very need to undertake process analysis will of course be lessened.

It is also possible to use the radar charts to summarise performance according to the responsibilities held within the business. How well is the Managing Director doing? Is the senior management actually performing well in those areas that are critical to the future of the business, as opposed to those areas that they are comfortable in? What is the actual contribution of the information systems department? Is the future strategy of the organisation

really dependent upon the development and delivery of new systems, or are other non-technical factors more important?

Finally, we must take steps to survey the opinion of our stakeholders about business performance, using the expectation measures that we established at the start (in Step 3 of the analysis), and tally the internal view of business performance with the external view.

Concluding comment

This overview of the analysis process has described its sequence and illustrated some of the results that typically come out of it. These results are one of the benefits of such an analysis, but it can also generate a great deal of discussion amongst those concerned in order to achieve agreement about details on the way through. As with any analysis, the *process* can be as useful as the *outputs*.

It is not a precise or deterministic method, and people who have adopted it have almost always adapted the details to suit their own circumstances and their preferences for details. The way in which an analysis is undertaken should recognise this; because of the volume of detail that can arise, any means to minimise the drudgery involved in dealing with large volumes of data is welcome. It will be found that the use of spreadsheets and database tables is helpful in recording the results of the analysis and in reaching appropriate conclusions and in the rapid production of reports in response to the many questions that will occur on the way through.

However, the purpose of a methodical approach such as that presented here is not to make the process mechanistic and precise, but to control the volume of analytical evidence and to make the process achievable and manageable where otherwise it would be hopelessly imprecise and difficult to control. Organisations benefit from seeing the connection between their high level vision and the operational consequences, and the method seems to deliver just the level of detail that is typically needed.

Managing with business processes

Let us remember that we are concerned with business processes in order to deliver business performance that is appropriate to the expectations of our stakeholders, and to ensure that we are investing in information systems in the most appropriate areas of activity. But there is one other view: that the processes of an organisation can be the basis of competitive strategy. Not all processes have the same significance, surely? If we are in a traditional manufacturing sector, then product development is not critical – internal efficiency will be more important to success. If however we are in the IT supply industry, then moving new products to market will unquestionably be the most important thing to get right.

The process triangle

One way of seeing the differences between different kinds of processes is the "Process Triangle" (see the figure)[4]. It is based on four kinds of process significance.

- Some processes are *competitive* and will be the basis of future success; here we need to outperform the competition.
- Some processes are not competitive, but are absolutely *necessary* if we are to be a credible player in our chosen industry,
- Some processes are important, but are so *pervasive* that they can be organised in our industry on a communal basis.
- Some processes are the basis of *future capability* and will ensure that the organisation moves forwards and maintains competencies appropriate to its strategic development ambitions.

The Process Triangle

Those processes with which the organisation intends to outperform the competition

Competitive Processes

Those processes that provide required future capabilities

Transformation Processes

Those processes that are necessary to exist in the chosen industry

Qualifying Processes

Underpinning Processes

Those processes that are necessary but can be organised on a communal basis

The strategic diamond

These differences between processes are important to understand because they demand different management styles and different approaches to implementation. Without an appreciation of these differences organisational

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[4] It might be noted that this idea – the process triangle – mirrors the applications portfolio. Similar arguments are used to distinguish at least the three categories: competitive (strategic), qualifying (key operational) and underpinning (support). However, it must be remembered that the process triangle is pitched at a much higher level than the applications portfolio. Where there might be hundreds of applications (information systems) there will be only a few processes – perhaps as few as four or five.

effort might be dissipated needlessly doing the wrong things well and failing to recognise those things that should be done well, if not to the highest levels of excellence (in the case of competitive and transformational processes). So, the purpose in having this classification is to highlight those processes that are important for different strategic reasons: for example for competitive reasons (competitive processes), for reasons of operational efficiency (qualifying processes), cost reduction (underpinning) and organisational development (transformation).

This then affects the way in which we would choose to assess the performance of a process. Competitive processes must be performed *better* than others in the industry, qualifying processes must be performed *as well as* others in the industry, whereas underpinning processes must simply be performed well enough not to impact upon the performance of the other more important categories of processes. Transformational processes must be performed at a level that will sustain organisational strategy.

It also affects the way we would assess the fulfilment of managerial responsibility. Senior managers must take responsibility for competitive and transformational processes and make sure that they are done well. Operational managers must take responsibility for qualifying activities and ensure that they are done well, according to operational measures of performance. Service managers must take responsibility for underpinning activities and ensure that they are done at least cost: there is no purpose in investing heavily in underpinning process activities.

Managerial issues in process management

As we noted at the start of this discussion of business processes, for a time it was the subject of unreasonable excitement and then of disillusionment. The explanation given here about process analysis should help to explain why people became disillusioned: although the intellectual challenges are not great (there are no complicated ideas involved in the analysis) there is a need to be methodical and the volume of analysis data can become difficult to manage. It also requires that a management team buys into the way of thinking about processes, in order that productive discussion and agreement can be gained. Herein lies some of the difficulty. It is not easy to persuade managers to follow the same line of thinking especially when they might feel that their future is threatened.

At the heart of process management is the need to see the business in a simple way, through models, in order to improve it. This gives us a clue as to some of the management issues that still surround business process management:

- **Business modelling:** By some means, it is necessary to agree how the business is most usefully modelled in order to be able to visualise ideas about processes and negotiate alternatives. Business models need to be

owned and nurtured, it is not sufficient to call in consultants and rely entirely upon them. There must be an internal capability and discipline for modelling, even if it is only to maintain lists of processes and activities as the main illustration of the zoo, as presented here. Graphical techniques might be more insightful and therefore more effective.

- **Process management:** Processes need to be managed, so that it is necessary to have process owners, to record the status and disposition of processes, and to maintain registers of pending problems and opportunities for action. There should be review processes that ensure that thinking about processes is refreshed routinely and that new ideas are able to be incorporated.

- **Stakeholders:** Stakeholders are critical to the successful development and implementation of strategies, and their hopes and expectations can be used to launch new thinking about how a business should work. Business models should be reviewed by stakeholders, and used to elicit stakeholder expectations and refine the details of those models.

- **Change management:** Business process driven change can directly impact on the personal domains of senior managers and will usually be seen (in the first instance at least) as a threat to the job security of the workforce. It will make great demands on the ability of an organisation to change and some would advise organisations with no history of change to not even get started. Happily, as the **first direct** example shows, it is possible to succeed provided that senior management are prepared to listen to the messages that are coming from below.

Some experts are inclined to dismiss the whole idea of business process management as being no more than a re-packaging of ideas that have been around for many years. This may be true, but to dismiss it on these grounds is to ignore the fact that despite the early difficulties it has captured the imagination of progressive organisations more than many other recent management "fads".

Because of its close association with information systems thinking and its reliance on systems in support of change, we can be sure that the general approach to managing business processes will continue to evolve and will be with us for some time to come.

Knowledge area 4: Business Benefits

Definition of benefits management

> *The process of organising and managing, such that the potential benefits of an investment of time and effort are actually realised*

Elsewhere in this text there are many references to the benefits that we might expect from an information systems investment, and there is much evidence of the complications that surround the successful delivery of such benefits. The problem is not so much understanding what a benefit is, rather understanding the management processes and activities that will deliver it.

Organisations of different kinds will desire different outcomes from their information systems investments. At an early stage in the life of a business the critical issues are all about growth and survival: identifying new markets, nurturing relationships with new customers, and getting basic capability in place to deliver products or services. The information systems emphasis might be on marketing and sales alone. A simple database to capture information about prospects and to organise information about meetings and orders. An Internet service with which to access the World Wide Web and to send and receive electronic mail. The benefits here are simple: basic operational capabilities without which the business would simply not be able to operate. In the mature stages of a business, information systems will be required for corporate governance, for managing the relationship with shareholders, and for managing the performance of a business that might have become complex and unwieldy. None of this is important to the entrepreneur.

Nature of business benefits

Costs versus benefits

It is traditional to undertake cost benefit analysis. Typically, one is expected to estimate and tabulate costs, possibly based on reliable quotations of cost for specific items but more often based on guesswork. Then, one is expected to estimate and tabulate the benefits in financial terms, and to bring the two views together using a spreadsheet to calculate net present value using (for example) discounted cash flow techniques; this allows the balance of short term expenditure and long term benefits to be more effectively assessed according to current rates of return on investments. Essentially, it allows the benefits to be assessed against alternative investments that could be made on the money markets by discounting future savings at a level that reflects the current return on simple financial deposits in the money markets.

A simple analysis might look something like the one below, where the costs are tabulated under six headings and the benefits under three, in each case over seven years, totalled both ways.

				Period				
Costs	1	2	3	4	5	6	7	Totals
Hardware	145,000.00	33,200.00	14,500.00	14,500.00	14,500.00	25,670.00	25,670.00	**273,040.00**
Software	45,578.00	50,135.80	55,149.38	60,664.32	66,730.75	73,403.82	80,744.21	**432,406.28**
Training	65,700.00	6,570.00	6,570.00	6,570.00	6,570.00	6,570.00	6,570.00	**105,120.00**
Operations	0.00	15,700.00	15,700.00	15,700.00	15,700.00	15,700.00	15,700.00	**94,200.00**
Maintenance	0.00	0.00	69,649.38	75,164.32	81,230.75	99,073.82	106,414.21	**431,532.48**
Other licences	134.00	3,459.00	3,459.00	3,459.00	3,459.00	3,459.00	3,459.00	**20,888.00**
Totals	**256,412.00**	**109,064.80**	**165,027.76**	**176,057.64**	**188,190.50**	**223,876.65**	**238,557.41**	**1,357,186.76**
Benefits								
Reduced head count	34,000.00	37,400.00	41,140.00	45,254.00	49,779.40	54,757.34	60,233.07	**322,563.81**
Increased sales	125,000.00	137,500.00	151,250.00	166,375.00	183,012.50	201,313.75	221,445.13	**1,185,896.38**
Other cost reductions	28,000.00	30,800.00	33,880.00	37,268.00	40,994.80	45,094.28	49,603.71	**265,640.79**
Totals	**187,000.00**	**205,700.00**	**226,270.00**	**248,897.00**	**273,786.70**	**301,165.37**	**331,281.91**	**1,774,100.98**
Benefits over costs	**-69,412.00**	**96,635.20**	**61,242.24**	**72,839.36**	**85,596.20**	**77,288.72**	**92,724.49**	**416,914.22**
Discounted	**-69,412.00**	**84,072.62**	**45,319.26**	**44,432.01**	**41,086.18**	**27,051.05**	**20,399.39**	**192,948.51**
Accumualted benefits	**-69,412.00**	**27,223.20**	**88,465.44**	**161,304.80**	**246,901.00**	**324,189.72**	**416,914.22**	**1,195,586.39**

Think about what you see in the table.

- The *cost elements* are typical of what can be estimated with confidence, from supplier's quotations and from assumptions about the yearly increase in licence costs and the like.

- However, the benefits are far more dubious. The head count saving seems to advance by about 10% per annum, but who knows what the salary bill will actually be for the next seven years? The idea that we might increase sales by a similar level each year, with a hefty increase right at the start, is very, very arguable, surely? And what credence can we give to "Other cost reductions"? Not much, surely?

The table shows the simple addition of benefits over costs (over the seven years) as almost 417,000, but when we discount that at 13% (in the line below) the benefits are more than halved. If we were to find that there was

no net increase in the three lines of benefit over time, then the net discounted benefit falls to negative disbenefit of -3,595 (not shown in this example).

The message here is that the numbers game is clearly easy to play, but the *reliability* that we can put on our estimates (even with techniques like discounted cash flow) is very limited indeed. In practice, people play games with the numbers and, in the worst cases, managers are cheated by means of complex spreadsheets wherein the contents are based on pure whimsy. Compare this with the pure logic that emerges from critical success factor analysis: if "X" is what we have agreed to do, and if information system "Y" is needed to do it, then we must acquire and deploy information system "Y". End of argument? Possibly.

In the general case we simply must have an agreed approach to the definition and management of the expected benefits. As well as getting the justification right we must follow through with appropriate implementation, thorough requirements analysis, project management, user training and hand over. And, we must then make sure that the promises that we made right back at the start are fulfilled. This cannot be done by the IT department alone, it must be done by those business mangers that are responsible for process management and business performance delivery. On their side, IT people do need to develop a service culture and put service management into place, and to understand the total cost of IT operations so that cost analyses can also be reliably fulfilled. The ongoing cost of installed systems usually exceeds the cost of acquisition and implementation, but the costs of operation are hidden, or not easily related to the cost drivers that caused them, and are therefore difficult to manage. This can make a nonsense of the discounted cash flow that was done in order to justify the investment.

Key to success is to understand users needs and expectations, undertake competent acquisition and deployment, and then to *pro-actively manage the delivery of the intended benefits*. Too often, the intended benefits that were so forcefully argued at the start of a project are never delivered in practice. We need to see evidence that business performance has improved, and to feed back the results of improvement initiatives to the next cycle of strategy formulation. Experience with complex systems such as customer relationship management (CRM) and enterprise resource planning (ERP) suggests that benefits are not just difficult to achieve, they might easily turn into disbenefits. Many organisations find that business performance actually suffers as a result of new systems, especially at this level of complexity and difficulty.

Benefits and the applications portfolio

The applications portfolio is important to an understanding of the nature benefits. Many organisations are stuck in the old rut of management thinking, that all benefits must be financial, so portfolio model gives us the best hope that we can pull management thinking out of the rut and persuade them to think more carefully about why they are investing in information systems at all.

STRATEGIC	HIGH POTENTIAL
Speed Accuracy Efficiency	*Understanding*
KEY OPERATIONAL	SUPPORT
Speed *Accuracy* Efficiency	Speed Accuracy *Efficiency*

Nature of information system benefits

In general we could summarise the benefits that we might expect from information systems as *speed*, *accuracy* and *efficiency* (although there are many more variations, as we shall see). The portfolio once again shows us how the relative importance of these three varies from one quadrant to another.

- Efficiency is absolutely critical in the support category. This is where we are most concerned to keep costs down. Accuracy is good to have, but a mistake in a support system will not actually bring the business to a halt – that is the sort of thing that happens with key operational systems.

- With key operational systems the focus is on accuracy. If an automated teller machine makes a mistake, then there will be huge costs for a bank. Speed and efficiency are not unimportant but accuracy is the benefit that we seek most of all.

- With strategic systems it is speed (of implementation, and benefits delivery) that matters most. Accuracy can be a problem, as banks have found with their new web-based banking services, but it is the first bank to get a web banking system up and running that wins the plaudits and engages the customers' interest. Once the new business is won, then it is time to tighten things up because the whole banking industry is following and it is necessary then to work on accuracy and efficiency.

- As is so often the case, the high potential system is a special case. We are not looking for speed, accuracy or efficiency, we are looking for new understanding. The organisation that chooses not to encourage (or even to prohibit) high potential systems will find that it is always a laggard, and it is always following a "me-too" strategy where decisions are taken only because others in the industry have already taken them.

In this way, the portfolio keeps us on our toes and reminds us of the subtle but sometimes very important differences between the different kinds of information system.

Attitudes to benefits management

In an ideal world, business information systems users will have the information that they need, at their fingertips. Those who must take management decisions will be enabled to take the best possible decisions by means of timely, accurate and relevant information. The deployment of new information systems will deliver the negotiated (or promised) benefits, whether through simple return on investment (despite the games that people play with the numbers), through less tangible outcomes such as we argue with critical success factor analysis, or simple profit. Users will be computer literate and well supported by experts. Then, there will be *clear accountability* for the effective exploitation of information systems and technology investments.

A survey into benefits management

Surprising as it may seem, surveys have indicated that almost no organisations (fewer than 10%, in fact) make any conscious effort to manage the delivery of the business benefits intended to come from information systems investments. Considering the high cost of IT-related projects, this is indeed surprising. In a survey undertaken some years ago, aimed at finding out what businesses had done to improve the prospects of information systems success:

- 52% of organisations were found to use structured analysis methods but were not convinced of the success of this approach.
- 54% were found to use formalised project management methods, but business managers just acted as "project sponsors" and again the success was very limited.
- 58% claimed to have an investment justification procedure, but admitted that it is a game they had to play to get proposals through executive committees or past other procedural barriers.
- Only 10% tried to manage the actual delivery of benefits in a formal way, and 76% believed that there was scope for improvement

These are astonishing results that would only be slightly different today. We are talking about very substantial investments, many well over $1,000,000 in value, that are justified based upon inadequate implementation capability and the weakest possible management of actual delivery of benefits. Relatively recent work[5] has generated a great deal of interest amongst senior managers, because it has developed a workable approach to "benefits management" founded on:

- The proper definition, categorisation and structuring of benefits.
- Proper planning to link benefits to process improvement projects.

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[5] At the Cranfield School of Management in the UK

- The allocation of responsibility for delivering benefits.
- Monitoring and measurement of delivered benefits.
- Seeking out additional benefits that might not have been apparent at the start.

The structuring of benefits is based on a scheme of dependencies (of benefits upon new systems, and of organisational strategy on successful delivery of benefits) that closely parallels the structure of the Information Management Body of Knowledge.

Two stages of benefit

Other research has taught us more about the nature of benefits, and cautions us not to expect too much too quickly. The problem is that people need time to adapt to new working practices associated with new systems, and according to the nature of change it could be several months before the full range of benefits can be expected.

Two stages to achieving benefit

Based on work by Saroj Patel

second phase needs

Time
Understanding
Experimentation
Behavioural changes
Learning to exploit
Consultancy support

Potential benefits

Structured training
Skills development
Focus
Repetition
Training
Documentation

first phase needs

2

1

Time

adoption   *(consolidation)*   *internalisation*   *(performance)*
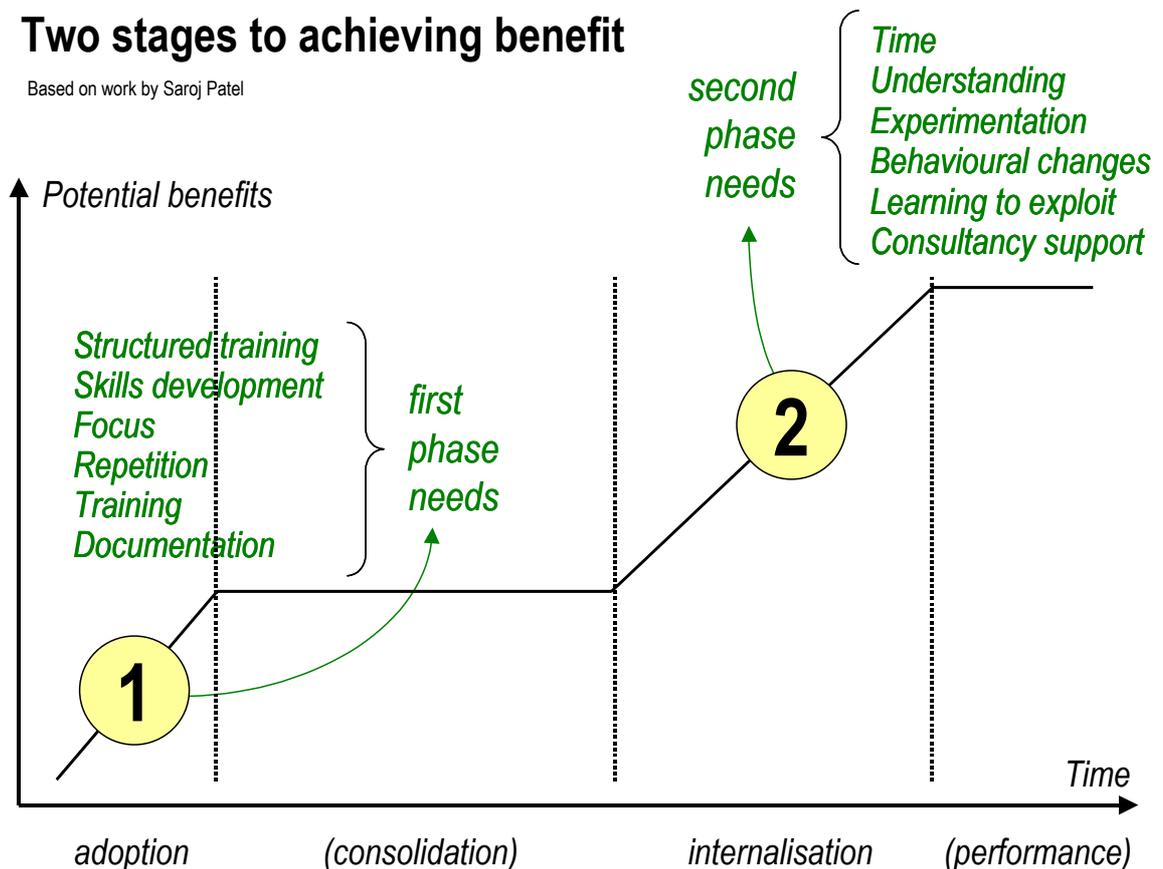
As the figure shows, there are two stages to delivering benefits.

- First, when a system is newly installed, there is the benefit that the users can work the system and (say) do the work that they are used to doing, but in half the time. This is the point at which people learn to use the

menu system and systems features through straightforward training, probably based on simple instruction and routine practice. There needs to be clear and helpful documentation to tell people what the system will do and the general level of working is what we might term "skills development". This stage might take a few weeks and it would be followed by a period of consolidation as user staff become comfortable with the new system and – in the best cases – begin to wonder how they used to manage without it.

- Then, as the system becomes more familiar, user behaviour can change. Although the facilities and functions of the system are exactly the same as they were when it was launched, users discover that they can start to change the way that they work and as well as becoming more efficient, they can become more effective. This is a familiar idea to all of us (think about when you just regarded your cell phone as a replacement for your land line, and then – slowly no doubt – got into the habit of saving your friends phone numbers, noting family birthdays and sending short text messages: that is the sort of shift we are talking about here). This second stage needs us to take a different approach to training and support. Rather, we need *education* rather than training, and we are not working from the book any more. We are thinking about how we work and how we can change it to become more effective with customers, suppliers, managers and our workmates.

This is a useful model, based on careful research by Saroj Patel, that tells us to plan for *two* stages of benefits delivery, not one.

Planning the delivery of benefits

Given that the early stages of project initiation and requirements analysis can take up to one third of the total effort in a successful project, it is surprising that so little effort is put into assuring the realisation of benefits. One of the problems is that at the end of a project the team tends to break up, most peoples' attention moves to the next project, where ever that might be, and the users are left swimming in a sea of confusion. The last thing they want to think about is benefits, they simply want to eliminate the confusion and try to get their lives under control again. So, at the end of a typical project the users are just happy to get the project team off their backs. It is enough to have to deal with the new system, without analysing what benefits are emerging from its use.

In order to successfully manage the delivery of benefits from information systems investments, it is important that this cycle of change is understood, that specific responsibility for managing the benefits is placed with an appropriate person, and that primary and secondary benefits are actively sought out and maximised. This requires that we work with benefits at a management level and that we set out to pro-actively manage their delivery.

An example

For example, consider a new telephone sales order processing system. It might include facilities to automatically dial customer telephone numbers and to present much more information to sales operatives about a customer's sales history, preferences and trading circumstances. This might speed up the process or it might allow operatives to provide a more fully informed service to customers and start to change the way they work. In the first stage, they will learn how to use the automatic dial facility and how to call for and understand the additional customer information. They are doing what they have always done, but more efficiently and more effectively. Later on, they will realise that the automatic dial 'directory' is a more effective way of dealing with all phone numbers and they will start to prefer it to the old paper directories. They may even lobby for the automatic dial facility to be extended to other parts of their work, for example in dealing with suppliers. At the same time management will realise that the automatic dialling is a potential source of new management information about the nature and number of calls made, and to whom. Even more significant, customers will learn that the additional information about their sales history is readily available to their supplier, and start to change their approach to buying. They come to rely on it, and start to make ad hoc enquiries because the supplier has better information about their purchase history than they do.

Relationship with process management and project management

Benefits are usually associated with projects. Project management is the mechanism we choose for justifying investment and executing the delivery of new systems. Often project management is seen as concluding with the "project review" or the "post- implementation review". These are actually very different ideas. The project review is concerned with whether the project plan worked and what new project skills have been accumulated that could be deployed in future. People will always have a view about a project, especially those in the project team, and it is necessary to take time to recognise excellent work, commitment beyond the normal call, and also to deal with problems that must be avoided in the future. But that is not the same as assessing the benefits that were to be delivered.

A project review can take place more or less immediately following the conclusion of the project (indeed, it is necessary to do so, before the body of people disperses to new projects in new locations). The delivery of benefits can only be judged much later, probably some months after implementation, hence the idea of the post implementation review. But historically few organisations have had the commitment to ensure that these reviews take place and – as revealed by the research reported elsewhere – there is a propensity to ignore the management of benefits all together.

A part of this problem is that benefits management sits above project management and may not be achievable on a project-by-project basis. Projects deliver new systems that are intended to improve business performance, and these improvements will only be visible at the level of the

business process. It is necessary therefore to introduce a new stream of management activity above the level of projects, and closely associated with processes. Sometimes, organisations adopt the idea of *programme management* in situations where there are many projects that all combine to deliver organisational benefits at a high level, and therefore where process management is not recognised it might be possible to pitch benefits management at the level of the programme, rather than at the level of the project. It is in any case a good idea to organise projects where there is *certainty*: traditional project management works best in situations where project plans can be laid out with some certainty. No project manager likes to struggle with project tasks that can not be tied down to determinable deliverables, times and costs, and so it is good practice to use programme management as the vehicle to manage the uncertainty that is sometimes unavoidable with large projects, and with strategic systems that demand substantial business change.

Hence, here we see benefits management as a separate management activity that might be strongly associated with projects, but is separate from them. It stands as a layer of management activity between project management and process management, and it will be concerned to see that projects deliver the sort of capability that improves business process performance in ways that serve the needs and expectations of stakeholders. For this reason, the benefits management regime needs to straddle the whole spectrum of information management activity, from information technology acquisition through to strategy.

The benefits dependency network

Terminology is a potential source of confusion when discussing the issues concerning information systems. One problem, already mentioned, is that people often fail to distinguish between the term "information technology" and the actual "information system", and then assume that the system will, of itself, deliver benefits. These words and phrases need to be understood and properly used.

A simple example

Look at the diagram below. It shows how information technology enables systems to be deployed, and then how the systems deliver benefits to the business. In the example, "electronic commerce" is the technology, and this is a good example of how confusion arises. If we talk about the "electronic commerce" system, there is no sense at all about what the system will do for us. Electronic commerce could be many things, but in the raw it is a capability to *build* systems, not a system in its own right. Look at the centre portion of the figure. Here there are four examples of systems that are meaningfully named: "online catalogues", "online order entry", "transport scheduling" and "track and trace". Each of these depends for its implementation upon an
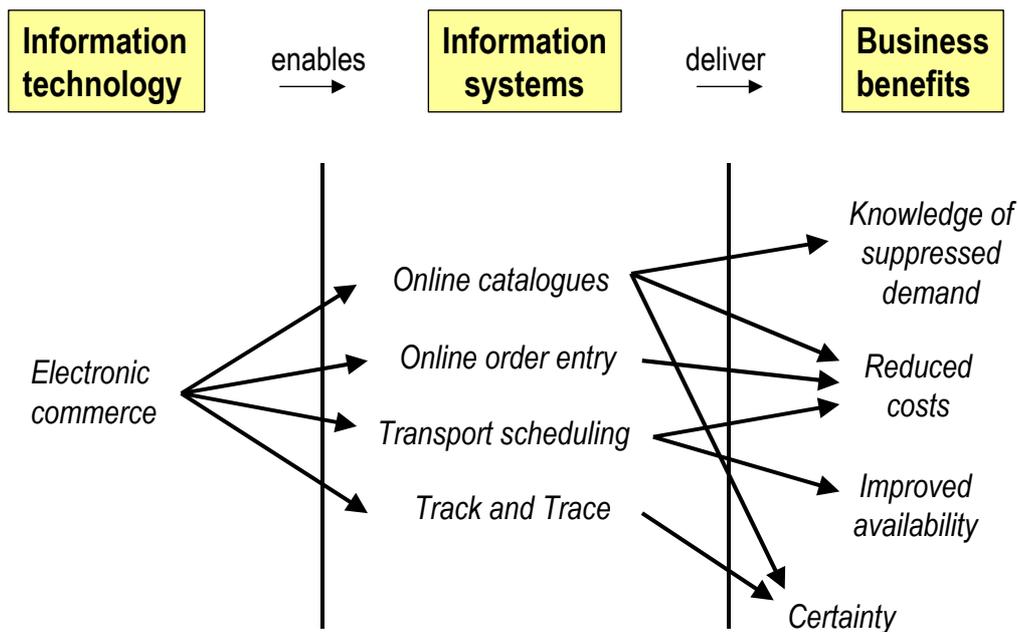
Transforming information technology into business benefits

electronic commerce capability, that will probably comprise internet communications hardware and software, server systems, database software, security management modules, and so on. Even if these technologies are acquired in a package, until they are configured for use and primed with the data that relates to our business, they are still useless. When they are configured and primed with data, then they become useful and deliver the benefits.

See how the benefits arise from different systems components. If we are seeking to reduce costs there will be many ways to do it – here "online catalogues", "online order entry" and "transport scheduling" are all attributed with cost reduction benefits. Something like "track and trace" – a system that allows customers to track the progress of an order that they are awaiting – may have more limited benefits, even only one: "certainty" in this case. This might however be a very important benefit in that no other business provides it, customers love to have it, and by itself it pulls in more business than was previously possible.

Equally, some systems components deliver many benefits. "Online catalogues" deliver information about suppressed demand, very important to retail business of course. In a conventional shop customers come and browse, and if they do not see what they want they simply leave: we fail to capture the fact that they were looking (say) for black gloves in size seven, and there were none. If we provide a catalogue then we will observe that they searched for that product and – more important – that we had none in stock. "Online catalogues" will also reduce costs because customers will answer their own questions about range and availability, we will not have to employ sales staff to deal with telephone and fax queries. Finally, they contribute to certainty by making

information easily available to all who need it, removing any uncertainty about range, availability and price.

This figure is a good example of the way that business benefits are dependent on appropriate systems, and those systems are dependent on appropriate base technologies. However, as you may already be thinking, it is just a little too simple to be complete. Consider:

- "Electronic commerce" is far too broad a phrase. We will need to know about the specific technologies that are to be used in more detail, for example what kind of security algorithms will we use? Exactly which database package is most appropriate? What server shall we have, and what operating system will it use?

- Some benefits will not come directly from a new system, rather they will come from changed business arrangements that improve business performance in some way, and therefore are dependent on whether people working for the business (sometimes even our business partners such as suppliers and transport service providers) can be persuaded to change the way that they work.

- The benefits are all well and good, but how do they serve the grander purpose that is embodied in the organisational strategy? There is no point in reducing costs when customers are still flocking to our door and when our profit margins are healthy; reducing costs might impact on service levels so severely that we lose business rather than gain it.

And so we find the idea of dependency to be useful, but not quite complete. There is a more advanced view of the dependencies in the figure below. It is referred to as the *benefits dependency network*. In the lower part are the terms that are used to refer to the five levels, and at the top is a simple example of how they might be interpreted in order to illustrate this more advanced version of the idea.

The benefits dependency network

Suppose that we have the high level objective to deliver increased sales. This is typical of a strategic remit handed down from the highest level of strategic planning, so that all functional areas must respond and make their contribution to the remit (not just the information technology department, but all areas of business activity).

The marketing department will be critically involved in responding to such a remit and will decide that they have to respond with new and more effective procedures for marketing. They may observe that the rate of conversion of sales calls to orders is low compared to their competition and decide that something must be done about it. In discussions, it is realised that sales effort is organised geographically but the need is to organise it differently. Despite the certainty of increased costs, it is decided to have national sales groups that address different market segments on a specialised basis, so that (for example) there is a banks team that sells to all banks irrespective of where

they are located and a manufacturing industry team that sells to manufacturing companies.

Sounds simple, but the problem is that all the information systems were developed in the 1970s with an old fashioned hierarchical database, organised around sales regions – the geographical view. It follows that a new database is needed that is able to support different views of the sales data, and

| Technology components | Enabling changes | Business changes | Primary benefits | Investment objectives |
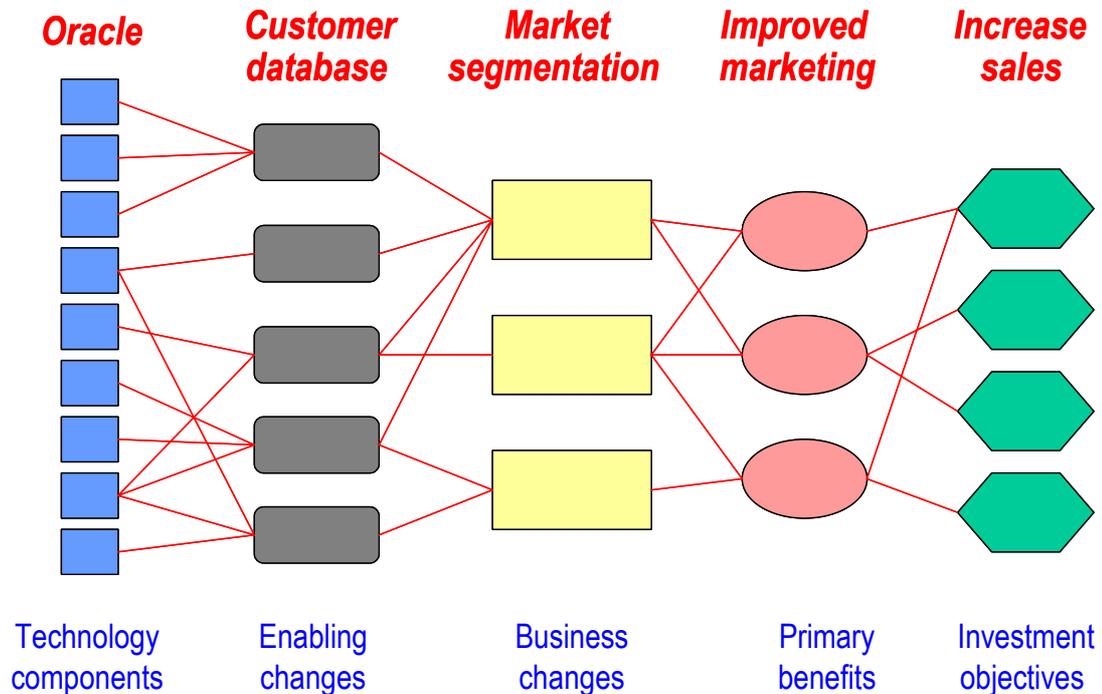
The benefits dependency network

therefore a relational database must be acquired, and it is decided to acquire Oracle as a leading example of the genre.

In this way, in a few words in a few sentences, we have travelled from purely strategic thinking to a very specific proposal to spend money on a new database regime. By itself the database software will achieve nothing for the business, but incorporated into new systems and populated with the data that describes customers, and what they buy, it will support the segmentation of the market into specific types of customer not just into regions. Now, we have a real prospect that we will *only* call on those customers who are legitimate targets for our sales attentions, and we will *only* deal with them from a position of understanding about their needs and the ways that they work. This is a simplified example and a moments thought will raise all sorts of other issues concerning other technology that will be required, the ways in which other areas of the company must assist in this changed approach to marketing, and the consequences for management reporting and decision making. As shown in the figure above that introduced this example, there will be many

inter-dependencies (the lines) between five different kinds of component in what we call the *benefits dependency network*:

- **Investment objectives:** Here we are talking about the few high level instructions that come from the high level organisational strategy. These objectives will all relate directly to one or more of the key stakeholders in the organisation and we must expect that they will be directed at meeting stakeholder expectations. Not all of them – strategic analysis will determine from time to time which are the more important areas of stakeholder concern to address. For example, if a telecommunications business is headed for privatisation the role of the customer is diminished as management attention is refocused on making the business attractive to investors. "*Increase sales*" is an easy example, others might include "*Reduce costs*" (another easy one!), "*Go international*", or "*Improve corporate governance*". In IMBOK terms, we are working here at the level of **business strategy**.

- **Primary benefits:** From the high level consideration of strategy come the more straightforward targets to be met by the different functional areas of the business. The HR department may have to recruit more staff, or staff with different skills; they may have to make plans to reduce the workforce by redundancy and retrenchment. The production division might have to re-tool a production line, or even create an entirely new one. The quality control authority might have to redefine QC procedures and drive the organisation through ISO 9000 inspection and registration. This is the level at which functional directors and senior managers pick up their personal targets that will determine their career futures. In IMBOK terms, we are working here at the level of **business benefits**.

- **Business change:** When senior managers have decided what must be done, they will set to work to change the way their people work or (in the case of service departments like HR and IT) to provide the support that others need. This sounds easy but of course it is not. It is especially difficult to do well when it is allowed to be seen as the role of the IT department. Even a successful IT department with a long history of successful information systems delivery can not be expected to deliver business change. This is where things usually go wrong. In IMBOK terms, we are working here at the level of **business processes** and the business activities that comprise them.

- **Enabling change:** Support for improved or revised business activity within business processes comes from new information systems. Projects that combine skills with information technology with skills in business procedures will acquire (or build) new information systems that serve the needs of revised business processes: the conventional information systems project. In IMBOK terms, we are working here at the level of **information systems**.

- **Technology components:** All of the above things are dependent on the availability of appropriate information technology. This includes more than

is sometimes assumed to be the case; we are not talking only about the nuts and bolts (or the operating systems and hardware systems components) but about *electronic commerce*, and *the World Wide Web*. Even at that level, until we have defined business activities that can incorporate electronic commerce and the web they are useless to us. Worse, if we *fail* to specify how they shall be used we risk extended wastage of time, money and resources trying to build systems from the bottom up. For high potential systems that might be a useful approach, but in all other cases the deployment of technology has to be done in the context of defined and agreed business requirements. In IMBOK terms, we are working here at the level of ***information technology***.
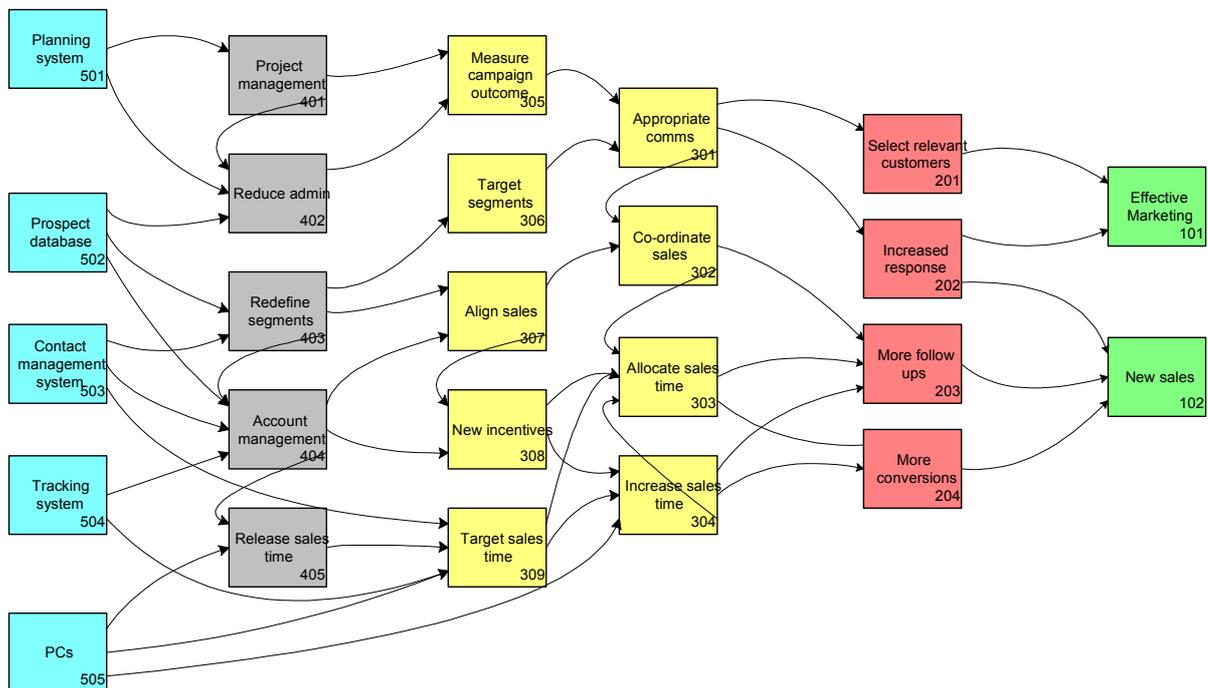
Benefits dependency networks:
An example from the pharmaceutical industry

Above is a more representative example taken from a pharmaceutical company that wished to increase the volume of sales and improve the effectiveness of marketing. See how the complexity in the centre of the network reveals the many interdependencies that must be managed. If they are not, if any link is "broken", then there is a real possibility that the investment in new systems to support the necessary business changes will fail. Note also how business changes (the yellow portion in the centre) are in some cases dependent upon themselves – the idea of inter-dependency can be used to further explain how each step in the logic depends on all the others.

In real cases it is the *development* of the network that is most useful. As is so often the case, it is not so much the end result as the process that brings

clarity and understanding to the arguments. Networks such as these should not be developed by "experts" from the "enterprise architecture" department, nor by consultants, nor by committees. They should be developed co-operatively by all involved managers, in workshops that are dedicated to the purpose and supported by appropriate facilities: whiteboards, flip charts, even brown paper and sticky yellow notes.

The benefits management cycle

An approach to benefits management has been devised that organises the necessary activities into a logical sequence. In principle it is no more than the classic management cycle of "Think, Plan, Act, Check" that comes so soon on introductory management courses. However, some of the specific techniques and ideas are interesting and very specific to the process.

Stage		Actions
1	Identify and structure benefits	Analyse drivers behind investment decisions, and reconcile with stakeholder expectations.
		Determine the different types of benefit and how they will be measured.
		Establish ownership and agree responsibilities for delivery.
		Identify business changes and stakeholder impact.
		Develop and stabilise benefits dependency network.
2	Plan benefits realisation	Determine change actions required at the level of enabling changes.
		Review with current project activities and map benefits to the projects that will deliver the enabling changes. Revise project plans where necessary.
		Finalise and disseminate benefits realisation plan: responsibilities, timetables, measures and targets.
3	Execute the plan	Monitor project progress and check against expected business changes and primary benefits.
		Review and refine benefits realisation plan as may be necessary.
		Manage the business change programme(s) and organise post implementation reviews.
4	Evaluate and review	Assess achievement of enabling changes, business changes, primary benefits and investment objectives.
		Review potential learning arising at all levels: from projects, business change programmes and benefits management.
		When done with planned benefits, use the project/programme team to drive through and leverage further potential benefits that could not have been anticipated at the start, based on learning achieved.

The table above summarises the actions required to achieve the planning and execution of benefits management. Note that we are principally concerned with the organisation of *primary benefits* and *business change* as identified in the benefits dependency network, above.

Stage 1: Identify and structure benefits

Building the network

The first stage is about working through to a dependency network that is stable and agreed by all those concerned. Different techniques will be needed to build a satisfactory view of each of the five "layers". Look at the figure.

| Technology components | Enabling changes | Business changes | Primary benefits | Investment objectives |
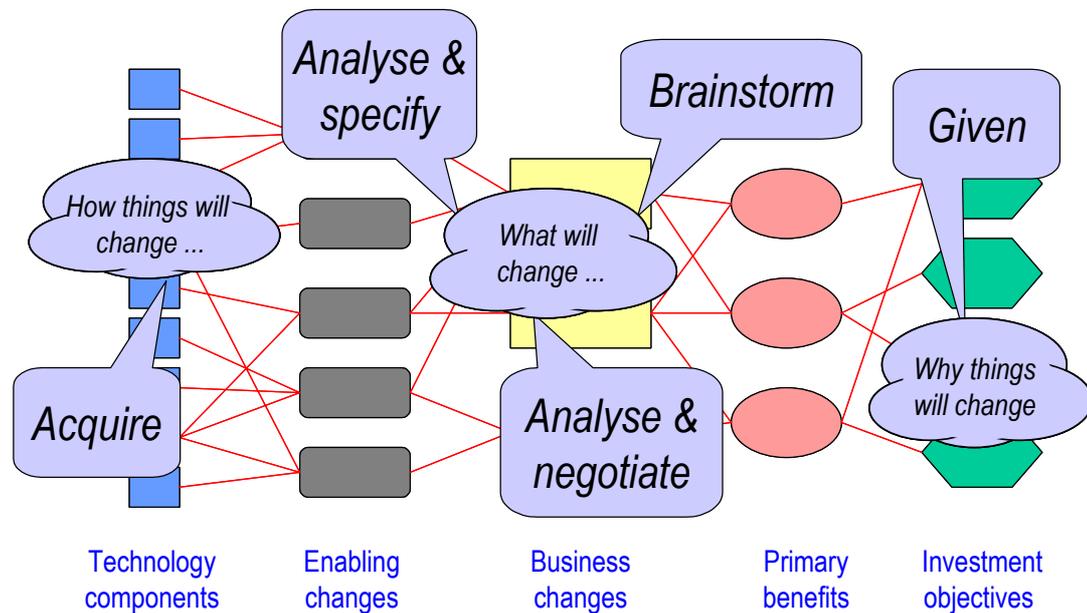
A network is achieved by consensus, not through the application of rules

Investment objectives are the reasons why things must change and they are *given*, but the translation of those high level objectives into the specific benefits that divisional directors can commit to might require some brainstorming. There are many choices as to what will change. If the board of directors have decided that we are to go "international" there are many ways to do it – through the use of web services directly connecting with remote customers, through the use of agents, or through the establishment of overseas offices. In each case, the required consequential changes to the business will be quite different.

When primary benefits are agreed, the related business changes will come from a more careful analysis of requirements and some negotiation of the details with those concerned. Then we can revert to conventional systems analysis and system design so that we can work through to the question of

how things will change: how we will acquire appropriate technologies and build appropriate systems, as shown in the figure.

Classifying the benefits

It is possible to take a simple view of the different kinds of benefit that might be sought: "efficiency", "effectiveness" and "evolution" come to mind ... but if we are to *demonstrate* the achievement of these different kinds of benefit, we need indicators:

- Efficiency is not really a problem; we can measure throughput and resource consumption and come up with reliable and defensible numbers.

- Effectiveness is somewhat more problematic. How do we measure "customer happiness"? If we are trying to reduce the number of warranty claims arising from faults in our products, how reliable is a measure of the number of returns that have been made?

- Evolution is really challenging. How do you measure the extent to which a whole business has moved forwards, with new values and a new culture?

There are other problems. At an early stage in the analysis of benefits that could be achieved, there will be differences of opinion about whether they are actually realistic. So, when someone argues for improved customer satisfaction there will be those who agree that it can be measured and those who do not. At the end of the day, it would be good if we were able to turn *all* benefits, even evolutionary ones, into financial returns, but we have already established that this is not easy and may lead to cheating and playing with "the numbers". The problem of categorising benefits in a way that builds stronger arguments for the boardroom has been addressed as follows:

- In the beginning, benefits must be regarded as **tentative,** and must be validated as being realistic to aim for. Suppose that our customer base is visibly reducing, and we want to invest in new systems to improve customer satisfaction. We argue that this will reduce the rate at which we are losing customers

- Having agreed that a benefit is realistic we must agree that there is the means to **observe** it, only then can we tabulate it with others to gain a complete view. *If our customers are all overseas, and they all speak different languages, how can we possibly observe their level of satisfaction? We would have to deal with this problem before we go any further, for example by investing in specialist help from a market research consultancy.*

- Observation is one thing, but **measurement** is another. A benefit may have a measure, but can it be measured? People can be weighed with a weighing machine, but can they be persuaded to stand on it? *Equally, can the customers be persuaded to co-operate with an international survey, and will cultural differences make the results of a survey useless? Suppose that we propose to ask the market research consultancy to run the survey periodically, so that in each area of our international operations we can see*

the difference from one period to the next, notwithstanding any differences in culture and general expectation from one country or region to another.

Finally, we have to try to turn measured benefits into a *financial* outcome. Once again we are facing the problem of the numbers, and it may be that when we promise a 20% rise in profitability that we are believed *only because we have a track record*.

Benefits identification workshop

Getting people together and discussing the potential for benefits and the organisation of them is probably best done through a workshop (or two, or three – it is found that at least three iterations will be needed to scope out and to stabilise the benefits dependency network). In a typical organisation such a workshop needs to be open to all, and certainly supported by all managerial stakeholders who may be involved in the delivery of improved business performance. The process of discussion and argument, focused on the emerging dependency network, is a good way to get all those involved thinking along the same lines and committed to the same objectives.

A first workshop will be directed at:

- Identifying the key drivers and objectives out of the organisational strategy and other high level directives that are evident.
- Identifying stakeholders, of all kinds. Generally, a stakeholder is seen as someone (or some organisation) that has an interest in an organisation and can impact on its performance (those who are interested but can not impact on performance can be ignored). In this context, it is about those who will be pleased to see their expectations fulfilled but also those who could block our plans and deny the achievement of objectives. So, we must gather our thoughts about the external *and* internal stakeholders who are concerned, and make sure that we have at least a preliminary understanding of their current and probable future attitude to the proposals.
- With this knowledge at hand, then we can set about the derivation of the dependency network and the structuring of benefits in a way that will suit the presentation of our arguments to all concerned, but especially to the senior management body that will approve the proposals. This means that we must attend to the question of measures, and the extent to which the measures can be achieved, and the extent to which they can be translated into financial outcomes.

In this way, the first workshop leads to stakeholder interviews, a deeper analysis and understanding of what is proposed, and – importantly – an understanding through stakeholder analysis of the possible *disbenefits* that might have to be managed.

Getting approval

At the end of the day, major decisions about information systems investments will be made in the boardroom and the promise of financial results may well be the only argument that will persuade senior management. Where there is no track record of successful delivery, no subjective argument about quality and probability will persuade and the request will probably be refused. When one reflects on the reliability of the information systems profession, and the relentless failure to bring projects in on time and to budget, it should be no surprise that senior managers are increasingly reluctant to invest on a wing and a prayer. Reliable performance to measurable targets is what this is all about.

A proposed benefit that can not be observed and measured can not be seriously considered as an argument; one that can, and that can then be turned into a financial outcome, is the best hope for an approval to invest.

Stage 2: Plan benefits realisation

Suppose that we have identified, organised and agreed the benefits that we seek, and that we have gained approval to proceed. It is now time to get more involved with the detail and we will wish to move towards the left hand side of the dependency network and look at the details of the technologies needed and the probable projects that will deliver the systems that are needed to enable business change.
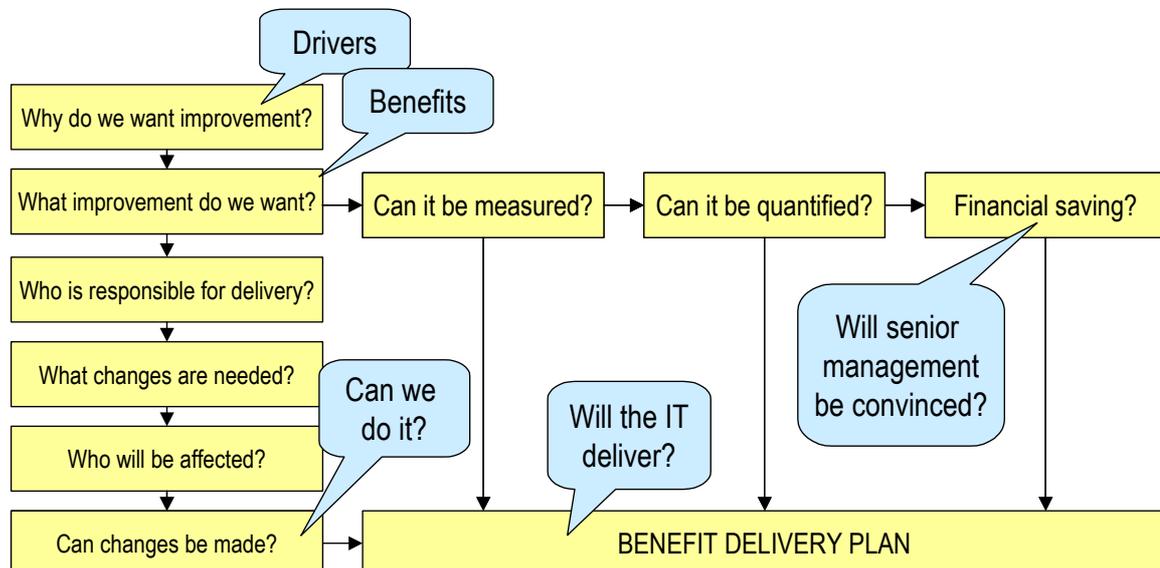
Benefits planning workshop

A further workshop – probably the second – would be directed to:
- The refinement of objectives and the ways by which measures will be achieved (this in itself requires that information – and probably information

systems – are available to derive and report on the achievement of measured benefits).

- A clearer and more detailed understanding of the business changes that are needed and the Identification of enablers at the level of new information systems, or changes to existing systems.
- Finalisation of the benefits plan including targets, responsibilities, timescales, and the resources to be committed to the execution of benefits management and delivery.
- Setting up of actual measurement and tracking of business performance in order to deliver the evidence that is needed.

Moving into action

Thus the second workshop leads to a wider dissemination of plans and to the start of education and change programmes that will support and facilitate the changes that are necessary. Managing business change is not easy, and within the benefits plan there must be actions to make sure that all stakeholders are pulled into line wherever possible, and that contingencies are in place to deal with any difficulties. Periodic reviews of progress will be part of the plan.

Stage 3: Execute benefits delivery plan

Responsibility for projects and benefits

With plans in place things will proceed at different levels. Project management will look after the specific work that delivers new systems and enhancement to existing systems, and benefits management will oversee all such work and ensure that the best possible chance of success prevails. It is important to recognise the difference between a project manager and the business manager responsible for benefits delivery. We might term the latter a "business project manager", who:

- deals with the investment proposal
- is the custodian of the benefits management plan
- convenes benefits review meetings
- is responsible for delivering the business benefits
- maintains dialogue with key stakeholders
- tracks and measures delivery of outputs

These are not jobs for a project manager, unless they are experienced in business management and have demonstrated their ability to deal with these things.

Dealing with stakeholders

As the work proceeds the potential problems with stakeholders will emerge. There are ways of anticipating and dealing with these. Consider the example on the page following that is drawn from a proposal where an expert system

| STAKEHOLDER GROUP	PERCEIVED (*DIS*)BENEFITS	CHANGES NEEDED	PERCEIVED RESISTANCE	COMMITMENT Stop it — None — Allow it — Help it — Do it
Customers	Configuration tailored exactly to needs	None	None	
Sales & marketing managers	Improved customer service and product quality image	New incentive to get sales reps to use system with customers	Reluctance to change reps reward system	current: C ... required: R
Sales rep	*(extra work in preparing requirements and quotations)*	To use system and improve quality of quotes	No time available to use system. Loss of autonomy	C ... R
Manufacturing & distribution	Removes need for configuration checking - fewer returns.	Stop current checks - to put onus on reps to get it right	Do not trust sales reps' accuracy in requirements and quotations	C ... R
IT specialists	New advanced system - old system goes	Skills in expert systems development	None	C R

An example of stakeholder analysis

will take over the configuration and specification of computer systems in a computer manufacturing business.

As the detail of the figure shows, the different stakeholder groups have different *current* views about the proposals, and we need them to have different *required* views if the work is to proceed. For example, the sales representatives and manufacturing division are against the plans because in each case it demands that they change the way they work, and both groups see these changes as problematic. We require the *positive involvement* of the sales representatives, so we have a lot of work to do there; we only need the manufacturing division to *allow* things to happen, we do not need their active involvement so that will not be so difficult. But in both groups there is work to be done, as is the case with the sales management and the IT department. No problems with the customers, they will be delighted to have a more reliable sales process that delivers what they need with fewer problems and no interference from sales staff that do not know the technical details that determine configuration needs.

Stage 4: Review, evaluate and exploit

When all is done, it is necessary to review what has been achieved, of course. This requires that all stakeholders come together and look at the latest reports of business performance, assess the success of the projects that delivered new systems, and check things off against the content of the benefits delivery plan that initiated the whole process.

Stakeholders:
Business managers
IT project leaders
Domain experts
Senior manager(s)

Benefits delivered
Benefits not delivered
(and actions arising)
Unexpected benefits
Factors that changed
General lessons learned
Further potential

Actions out of this investment
Potential for new benefits
Lessons for other projects

Documentation

Benefits plan
Project summaries
Business performance reports

Benefits review

As is the case with any review, it is important to document successes and failures, to assign actions arising from the work, and to learn from all that has happened. In most cases there will be some success and some failure, but happily there are usually some additional benefits apparent at the end of the cycle of work that could not have been anticipated at the start. It is important to pursue them whilst the going is good, so to speak, and that represents the conclusion of the benefits management cycle.

Managerial issues in benefits management

It is interesting to see how the will to undertake benefits management arises in an organisation. One might imagine that once it is understood it would be adopted at the start of a major investment cycle, but this is not what happens. More often, at the end of a particularly difficult project, management will undertake a post-mortem, determine that things were not done well and then try to "reverse engineer" benefits management from a situation of potential (or actual) failure.

Some of the benefits management issues that must be considered include:

- **A regime for benefits management requires effort.** The reasons for it need to be clear and the additional work involved needs to be related to the merits of the idea, in particular the prospect of more rewarding investments in information systems. This will require a period of management education, by any appropriate means.
- **Different kinds of business benefits arise from different kinds of information system**. These benefits must be used appropriately to justify an investment in information systems related change. There are

qualitative benefits as well as quantitative ones, but qualitative benefits are more difficult to manage.

- **Business benefits can be seen in non-financial as well as in financial terms**. But at the end of the day financial arguments are going to be the most persuasive in the boardroom. It is possible that successful benefits management will allow non-financial arguments to be more willingly received, as a track record of successful delivery emerges.

- **Procedures for reporting the achievement and delivery of business benefits are needed**. This might require changes to the management information and reporting systems in an organisation, and it is most useful when the reports of benefits can be set beside reliable reports on costs – then the net return on investment can be clearly seen.

- **Management responsibility must be determined**. Responsibility for the delivery of business benefits must be decided in a clear manner, and must be willingly accepted by those concerned.

- **Risks and disbenefits are part of the process** and must be dealt with. Disbenefits will be evident in stakeholder analysis, which is an important component of benefits management planning. Benefits sometimes also include stopping doing things that are no longer productive

Knowledge area 5: Business strategy

Definition of strategy

Strategy is about change. Without change, there is no real need for strategy. With change in mind, we can argue that the simplest definition of strategy is:
knowing where you are,
knowing where you could choose to be, and
knowing how you intend to get there (roughly speaking).

In line with this simple definition, developing new strategies can be quite straightforward and quite fulfilling. With basic strategic analysis tools at hand strategy formulation is not too difficult: it's just a matter of talking to the key players, applying the tools, and summarising what must be done (Oh, and you have to get the whole management team to agree, of course! That might be a problem). If strategy formulation is relatively simple, *delivering* a strategy is not simple - it can be a nightmare of confusion and difficulty. There are no tools that will guarantee the easy implementation of a strategy - just persistent effort to communicate ideas, motivate action, and manage change.

Strategy can be more formally defined as 'an integrated set of actions aimed at increasing the long-term well being and strength of the enterprise'. There is copious literature about strategy, and a good selection of books specifically about strategic planning for information systems (see the bibliography for details).

The notes provided here show how information systems planning can become more effectively linked to business planning, and hence be driven by business management rather than by the IT department.

Nature of business and information systems strategy

The need for alignment with business needs

In the past the information systems strategy of many organisations was essentially the summation of existing activities and plans, which themselves often derived from the bottom-up development of systems rather than a coherent business driven plan. This piecemeal approach to systems resulted in missed opportunities and inefficient use of resources. Perceptions of success or failure were once based on an organisation's ability to deploy technology without regard to business change. This has changed, of course. Most examples of success today are based on significant changes to the way a business works, and an ability to manage that business change at the same time that new systems are deployed. There is a clear need to align information systems strategies with the business strategy, and in the case where there is no business strategy the effort to deploy information systems effectively will be frustrated. Investments in information systems must be in harmony with investments in new product development, human resource development and other strategic areas such as marketing and customer relationship management.

Today, investments in systems and technology by customers, suppliers and competitors can require an organisation to attend urgently to its information systems, and to the way that they are managed. Ignoring such pressures risks significant business disadvantage, and so change is forced upon an organisation. Change must be managed, and the way that we do that is popularly argued to be through strategies. Without change, there is no need for a strategy. With change, we need one, although the nature of strategy can be very different in different kinds of organisation.

Strategic contribution of IT

The potential value of good information systems is not often understood. Financial considerations alone are not appropriate – in many circumstances the benefits of IT-related investments are not financial but strategic. Just having access to information that was previously unavailable is a benefit (especially management information, which is notoriously difficult to provide); enabling actions that were previously impossible might just lift an organisation above a critical threshold of success (whether we are thinking about large scale businesses or the needs of simple rural individuals). Trying to reduce all kinds of benefit to a simple financial argument is inappropriate, although it does of course help when it comes to a boardroom decision.

The ability to take a strategic view of information systems is therefore important. The alignment of business and information management strategies requires that managers have the necessary tools. On the one side, technology-related opportunities must be accommodated in strategic thinking;

on the other, appropriate information systems investments must support the realisation of the wider business strategy. The benefits of information systems implementation can only be achieved with proper planning, based on organisational strategies that are appropriate and understood.

Consequences of a lack of strategy

In all cases, the lack of a coherent strategy for the business at large, and for information systems in particular, can result in any number of the following problems:

- Competitors, suppliers and customers may gain avoidable and undesirable advantages.
- Business goals will become unachievable because of information systems limitations.
- There will be duplication of effort, inaccuracy, delays and poor management information because of a lack of proper systems integration.
- The delivery of information systems will be late and over budget.
- New information systems will fail to deliver the expected benefits because of a lack of clear focus on business needs.
- Priorities and plans will change continually leading to conflict among users and systems staff, and poor productivity all round.
- Technologies will become a constraint to the business because of a failure to maintain compatibility where it is needed.
- Inappropriate systems and technology resource levels.
- A failure to evaluate information systems investments and to set implementation priorities consistently.

It is very common for information systems to incur a greater expense than is necessary, and for benefits to fall well short of expectations. A failure to manage strategically generates organisational conflict and wastes management time; to achieve strategic management we must learn to manage the demand for information systems in accordance with business needs, and to manage the supply of systems and infrastructure in a coherent way. In the end, we must find the means to deliver strategy, perhaps the most difficult thing of all. Many experts argue that project management is the means to deliver corporate strategy, but as we learn from the IMBOK there are many more aspects to successful information management than that alone.

Differences between information systems and information technology strategies

A common question is concerned with understanding the difference between an information systems strategy and an information technology strategy.

- **Information systems strategies** define the information and systems needs for activities within the business. IS strategy should define what information systems the business needs for the foreseeable future based on

proper analysis of the business, its environment and the general business strategy. The objective is to establish the demand for new systems, aligned closely to plans for the business and its development. It may not be feasible to satisfy all these requirements for economic or technical reasons, but as indicated in the figure (below) this can be worked through in the planning stage. A good strategy will also make clear who is responsible for implementation and delivery of new systems and for the benefits that they bring.

- **Information technology strategies** define how system needs will be met and the information technology that will be required to acquire, develop and operate existing and future applications. This involves determining how applications will be delivered and how technology and specialist resources will be acquired, used, controlled and managed. It will describe the activities which need to be undertaken and how they are to be organised, and it will thereby provide foundations for the definition and execution of systems projects that will ultimately deliver benefits, and thereby the strategic objectives of the business.

Different kinds of organisation

Large, formalised organisations will strategise in a formalised way, with responsibilities allocated and methods of working prescribed. Smaller organisations might deal with strategy very differently – possible by means of short conversations over lunch or over a weekend. However, both will do better with strategies that are well aligned; information systems strategies are at particular risk of misalignment because of the nature of systems (they are difficult to visualise and articulate) and because of the incessant pressure from raw technological innovation, which has tended to drive information strategies from the bottom up, rather than allowing them to be driven from the top down. Alignment problems between business and information systems strategies must be addressed. There needs to be an equal interest in both value creation and cost containment, and strategies must recognise and address required resources and risks. For example, outsourcing is clearly an interesting opportunity, but it is not easy to know how to select and source development and implementation needs in this way, and the risks of such partnerships are not fully understood.

Development of information systems strategies

Systems strategy in context

The figure below shows how the general issues surrounding business strategy combine to make a sensible planning process for information technology and information systems planning. The external business environment in addition provides most of the strategic drivers that tell us "why" we must act. External and internal inputs combine to provide us with the "what" must be done. The

general technology environment is best seen as generating opportunities but not drivers, unless our overall organisational strategy is to be driven by information technology developments (as would be the case if we were operating in the software industry, or if we specifically want to be a technology leader).

At the heart of the figure is strategy formulation and implementation, driven by "why", targeted by "what", and constrained by "how". If all these factors can be taken into account, then the resulting plans for systems implementation should be both viable and appropriate. We can see how the current portfolio of information systems (itself an important input to the question of "what") becomes augmented and enhanced by new information systems that are in accord with business strategy and capability.

Of course, this simple logic is not always reflected in the reality of strategic planning. When the process driven by technology thinking it is termed "bottom up" planning, where whimsical technology-based opportunities determine what shall be done. Before you set out to agree that this is a viable approach, reflect for a moment on how much money has been wasted in pursuit of data warehouses, enterprise architectures, and other transient thinking of recent years. "Top down" is better than "bottom up", although we must always be cognisant of technology related opportunities; it is just a question of getting things into perspective and making sure that they are balanced by agreed business needs.
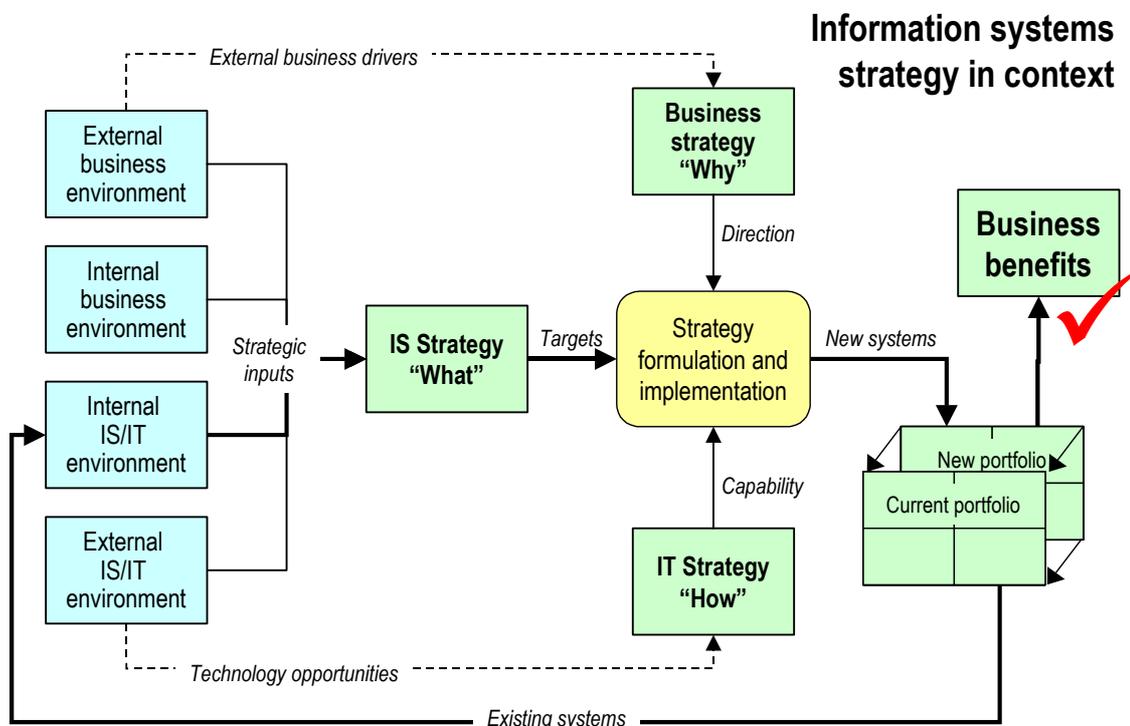
The following notes describe some of the features of the figure in more detail.

The external business environment

The industry forces bearing upon a business are complex, and concern economics, structure and (perhaps most importantly for systems planning) the current basis of competition. The role that information systems and technology is playing in the industry needs to be understood.

For example, the increasing power of retailers over manufacturing companies has been enhanced by retail point-of-sale systems and the information these provide for the retailer. Manufacturers need to consider how their systems might be developed to either counter that pressure or perhaps better understand the potential of retail systems to gain some mutual benefit; what some manufacturers have done (particularly in the fast moving consumer goods sector) is to work with retailers to develop systems that give them moment by moment information about sales, and then negotiate a sharing of the benefits that arise from improved sales information and reduced stockholdings.

The business environment will continue to change, in some cases faster than the lead-time necessary to develop new systems (although possibly not faster than the change in base technologies). The speed of change needs to be reflected in reduced systems development lead times that in turn determine many aspects of the systems delivery plans

The internal business environment

An organisation's stated objectives and strategies are sometimes vaguely expressed and not well understood. Unless these are clearly defined resulting strategies in all sectors will be equally vaguely focused, and become subject to whimsy.

Then there is the question of business operations. It might be surprising to learn that not all businesses actually understand how they work. It is difficult to find a single person (or even a group of people) who can explain how it works other than within a very limited scope of their own understanding. It is therefore necessary to undertake at least some analysis of what the business does, how it does it, and how it is organised and managed. Such an analysis takes some account of the external business environment (most likely through some degree of stakeholder analysis) and will be concerned with the business mission, activities, capabilities and structure. It may well reveal weaknesses in current organisational allocation of activities, which can be addressed by better systems, possibly with some degree of organisational change. But, as we have noted, it is important not to become constrained by organisational models if the best advantages of information systems investments are to be gained.

With process models at hand there is a basis for performance analysis, especially in terms of resource consumption, cost drivers and value generated; then it is possible to identify areas of potential benefit by the introduction of new or enhanced systems that reduce costs, reduce the demand on resources, or increase the added value.

The internal IS/IT environment

Existing systems, technology and information resources are the baseline from which a new cycle of investment will be launched. As can be seen from the figure, the current applications portfolio is perhaps the most important feature of the internal environment and will be the target of our efforts to improve the deployment of information systems.

The current portfolio must be assessed according to its contribution to the business, and the categorisation of information systems into the different quadrants, according to current relevance and future potential, is the best guide to doing this. At the level of information technology operations, IT assets and resources need to be catalogued and examined in order to determine whether current capabilities and infrastructure are adequate for future needs. This is not just an audit of current technology but a review of the people, their skills, how they are managed, and the methods used to develop and support systems and the requisite infrastructure.

Implementation difficulties are the main reason why strategies often fail to deliver the changes required. A lack of resources, skills or management process, or any combination, will make it difficult to see the implementation of strategy through to the bitter end. Perhaps the key issue (and the most difficult for the average IT manager to deal with) is culture and style. The IT department so often seems to be living in a different world from the business and cultural differences run deep. Reconciliation of culture and attitudes is a critical aspect of implementation, and conventionally the most difficult. Any device or managerial technique that gets technology specialists and business generalists to live and work together will be most welcome.

The external IS/IT environment

The external environment is constantly seeing the emergence of new technologies, and their take up by organisations is generally seen as "early technology adopters" or simply "technology leaders". For those organisations that do not want to sit on the crest of the wave it is useful to see how others are using new technology before making any commitment. This is just another strategic decision that has to be taken.

Technology trends and developments need to be evaluated. There are many ways to appreciate and interpret new developments in information technology. From simply surfing the web, especially those web sites that specialise in technology watching, right through to purchasing consultancy reports at great cost, there are numerous options available. Perhaps the least cost but most effective technique is to choose your friends well, and then make a habit of conversing with them in idle time.

There will be short-term and long-term implications, and timing is another factor. If a leader, then there is a need to move quickly. If a lagger, then it is just about how long to wait, and what will be the criteria to determine take-up. All new technologies imply some risk and a learning curve for the business.

Early understanding, interpretation and selective use of developing technologies may enable a future advantage to be identified and obtained. A failure to understand (as in the early experiences with the PC, and more recently with the web) will lead to much wasted time and money.

The use of technology is evident from newspaper reports and through specialist commentators. Knowing how others are employing information technology within your industry, to what purpose and with what success, is a key factor in deciding strategy. It is important that an organisation understands the business implications of what its competitors, customers and suppliers are doing with information technology but it should not be difficult to find out the details. The more difficult thing is to decide what the specific implications are and what needs to be done.

Summary of strategic inputs

The potential impact of new systems on business performance depends not only on what the business wishes to do but what others are already doing. It is the combination of external pressures and internal capabilities that needs to be balanced to ensure proper alignment of systems and business strategies.

The analysis process described here will be the best guide to achieving viable information systems strategies, provided that agreement is reached as to terminology and process, so that everyone is working on the same basis. Issues and problems will arise, and as the process is exercised it can be refined to include places where problems can be parked pending proper resolution, and where decisions can be recorded so that their significance is not lost. As with other analysis methods and procedures, the figure makes it look simpler than it is. The volume of strategic data needed can be overwhelming and a proper document and information management system is needed for the strategic process itself.

A final comment needs to be made about timescales. On the way through this discussion we have passingly noted that the timescales for emerging technologies, system development, and business change management will certainly all be different. There is a school of thought that says the only viable strategies today are flexible ones; agility is the name of the game, and the best strategies are those that work on the basis of constant change. Every organisation needs to think about this, but if there is to be any effective management control of business development, cycles of strategic planning appropriate to change management need to be adopted. Let the technologies emerge, there will be a new one tomorrow. Beat project timescales down so that systems implementation takes no longer than necessary, but do not push the business over the edge when it comes to managing the concomitant business change. That can lead quickly to disaster.

The strategy process

Current situation appraisal: 'where we are now?'

First we must study the competitive and industry forces that are bearing upon the organisation that need to be addressed. Where are there deficiencies in current operations? What new technologies and resources do we have, or could we acquire, that might contribute to business development?

This is the stage at which SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis can be used to summarise the internal and external factors that might affect strategic intentions. Strengths and weaknesses are clearly internal in origin, opportunities and threats come from outside, especially from the realm of competition. In the specific area of current operations, business process models at different levels provide a framework for analysing cost and efficiency and the prospects for improving both with new information systems – perhaps a simple value chain, perhaps a more detailed model of all key processes and the activities that operationalised them. An assessment of current information technology and capabilities within the organisation will reveal shortfalls (or surpluses) that demand management action.

Opportunity spotting: 'where we could be?'

Based on an analysis of business activities and information-dependent processes, the outcome of situation appraisal will be a number of potential options for information systems investment. There will be an ideal set of options developed with no regard to resource constraints, but then it will have to be moderated by careful consideration of what will be possible given available resources, and what timescales determine the need for action. Prioritisation will be largely based on those opportunities that will yield the earliest significant benefits.

Scenario planning will be a useful approach that allows discussion – possibly even brainstorming – to work through different scenarios and begin to understand some of the implications and potential benefits. A model of high level business processes can be re-appraised and reconstructed, to see what the consequence might be for organisational structures and for external business partners. Reconstruction of the value chain, for example, is a good way of examining options for moving sub-optimal activities out to specialist business partners that could undertake them at lower cost and with improved performance.

Decision time: 'where we want to be?'.

The final decision about what will be done will be based on a systematic review of business objectives and the information systems dependencies that are critical to achieving them: critical *systems-related* success factors, if you like.

Critical success factor analysis is a popular technique that will lead to a more specific understanding of information needs and areas of business where improved systems will deliver the most benefit. Out of this come the key areas for short and long term action: the required plan for information systems development, enhancement and correction. Perhaps some of the ideas from the prior stages will be put on one side and, because they are worth further consideration, then brought out for later review if related factors change.

Summary

We have put forward two related ways of looking at strategy.

- First, the "*Why, What and How*" questions that take us through the logic of strategy: What pressures are there to anything at all? What specifically needs to be done, and how will we do it?

- Second, the "*Where are we now? Where could we be,* and *How shall we get there?"* questions that have a strong sense of project planning. What is the route map from where we are now to where we want to be?

The first has a sense of logic to it – almost a "snapshot" view of the state of the business, arguing from the imperative to act to the "how" question, but with a strong sense of required resources and capabilities; understand the pressures, identify the hot spots, and check out that we have the wherewithal. The second has a sense of timing to it – setting out a route map that will take us to our destination; understand our current situation before we do anything, work out the options and set out a plan of action.

These two frames can be used to summarise what we must do. In the table below the two are set in the rows and columns to provide a final overview of the sort of questions that we can ask. Study the table, and see if you agree that there is a progression from the top left corner (embracing just the "what" and "where are we now") as the starting point, to the lower right hand corner (picking up all remaining cells on the way down in two stages, as indicated).

	Where are we now?	Where could we be?	How will we get there?
Why	• What industry forces are bearing upon our business success? • What stakeholder pressures should be influencing our thinking? • What is the state of customer relations, and what messages are we getting from customers who we work with? *Start here*	• What are our competitors doing that set expectations in our industry, that we should try to match or exceed? • Do we understand what our customers are hoping that we can do for them, in terms of systems-related products and services?	• What do we know about potential industry partners who might already be thinking of working with us? • What successes have we had that we can capitalise upon so as to maintain the momentum that we have achieved?
What	• What strengths do we have that we are not completely deploying? • What deficiencies do we suffer that need to be redressed?	• Where are the current hot spots in our kind of business? • Are there any specifically interesting technology-related developments that present interesting and synergistic opportunities? • What weaknesses have been exposed in our operations that give cause for remedial action? *The middle stages*	• What spare capacity do we have that we could redeploy? • What changes in organisational structure are in hand, or needed, that might assist or confuse implementation?
How	• What are our current systems and infrastructural resources? • What capability do we have to acquire systems, or to undertake in-house systems development?	• What new capabilities do we have, in information technology areas or elsewhere that we can deploy to improve our prospects? • Are there industry or other partners we could approach to find synergistic approaches to implementation issues?	• What partnerships do we have that might facilitate new systems? • What is our capability to undertake project management and see systems implementation through? • What capability do we have to achieve significant business change, and what is the quality of senior management support and commitment? *Finalise action planning here*

The framework for strategic analysis gives all management the opportunity (and even the obligation) to involve themselves in the discussion of ideas and the establishment of a demand-driven, opportunity-seeking plan for information systems investment, quite separately from considerations of technology alone.

Implementation of strategy

A critical issue in strategic planning for new systems is to prioritise the work that comes out of the process. That will come from a number of considerations, but business process analysis such as we have explored in the previous section will be a large part of the story. It is through an understanding of critical business processes and the current quality of business activities that support them that we can find the most important areas to work on and invest in. Then, we must make specific plans for each of the emerging projects that will deliver new systems, and thereby deliver the hoped for organisational benefits.

It is a corporate responsibility to balance demand and supply issues and to ensure that business plans are achievable. There must be a process that brings together business and systems planning activity and the products that they produce. Too often, planning has been driven in reverse. New systems projects are defined, built up into a plan and presented to management for ratification as a 'strategy', but without any actual reference to business strategy. Informal thinking has dominated systems plans because of a lack of direction and a lack of appropriate analysis tools. On the other hand, informal thinking must not be completely stifled by too rigid a planning process. Much of the competitive advantage that has been won from new systems has its origin in unfettered opportunistic thinking, and not always at the highest levels of management.

While senior management will always be involved, it is necessary that line management undertake the primary responsibility for systems plans and incorporate them into their own functional plans. Business management must drive new developments through to successful achievement of strategic benefits – the IT Department cannot do this on their own, nor should they even be involved in all cases. Success will depend upon related business and organisational changes which must be carefully planned and implemented.

Establishing the IS/IT strategic planning process

The planning process must itself be managed, especially in terms of scope and duration. It can (and it must) deliver valuable intermediate results throughout the process, not just at the end. It is therefore a matter of:

- what is involved,
- how it is to be achieved, and
- what the expected products are to be.

If these things are not agreed at the start then we are already headed for failure.

An important initial question is therefore to decide what is involved. In smaller businesses, the whole process can be relatively informal and will probably embrace the whole of the business at once. But, as soon as there is more

than one "business unit" within the business we need to be careful. We generally define a business unit to be a part of a larger business that addresses its own markets. Hence, a business unit:

- has a single identifiable family of products or services
- addresses a single identifiable market, and
- has identifiable competition

Where a business is not already organised into business units that satisfy these criteria then an arrangement must be made, in order to make the strategic analysis "do-able" and useful. This might require that the physical business is looked at in a "logical" way, then the approach described here can be expected to succeed.

Common problems

Some of the main reasons why such strategy studies fail are as follows:

- Top management commitment to implementing the plan cannot be obtained.
- The planning exercise takes too long for management to sustain interest - it is also very expensive and takes up too much of the management's time.
- The process produces an overwhelming volume of detail that is difficult to interpret.
- The resulting plan fails to spell out resourcing and financial implications.

Top management commitment is one of the oldest problems and when you consider the distance (as revealed by the IMBOK) between technology as a cost driver, and strategic fulfilment as the realisation of our hopes and dreams, it is not surprising that senior management have had increasing difficulty in understanding the arguments to invest in technology and systems.

Timing and management of strategic analysis is also an old problem; the problem of "paralysis by analysis" is a common one and those working on strategy formulation projects must be pushed to deliver in reasonable time frames. Strategy formulation is actually a very elastic process, and to embark on a fixed plan for strategy development involving a long sequence of steps is a mistake. Take the ideas presented here and have a three-hour meeting; see what comes out of it, and then run through the whole sequence again. When some stability in the consensus viewpoint emerges, go for a decision and get on with realisation and implementation.

The problem of voluminous detail is also very common and evident in the size of some of the strategic documents that will be seen in senior management offices. Again it is worth quoting a specific example of how this problem can be solved. Vic Lumby, Chief Information Officer of the Old Mutual (financial services) business in Cape Town explains that his IT strategy is just four PowerPoint slides. "Well, four slides out of a total of fifteen" he adds with a grin, "and I *have* presented them more than 52 times". Something to think

about there, surely? Why does strategy have to be more complicated than four slides, and what is the consequence of making it so?

Getting started

For an organisation that has never undertaken a strategic analysis of information systems potential, there is always a first time. We are reminded that it is important to deliver some useful outcome the first time around, otherwise the process and the people involved will be discredited.

There are three main approaches adopted for strategic planning, namely:

- Set up a special IS/IT planning function to carry out the task, located within the IT department, which then owns the strategy.
- Employ consultants to bring in the necessary skills to facilitate the process.
- Set up a task force or steering group to do the job, preferably led by an experienced and respected business manager.

The use of consultants carries large risks. They will typically produce a detailed report but probably fail to cede ownership of the ideas to the client. It is worth negotiating to make sure that there is some provision for "knowledge transfer" from the consulting team to the client. Some consulting companies do this willingly, others do not.

The third option, the task force, is not the easiest approach but it is by far the best. Not only does the resulting strategy belong to the organisation, but also it is more likely to be truly business driven, to be carried out efficiently, and be realisable. This is the approach most likely to succeed.

The longer term

Following the first iteration, a longer-term approach needs to be established. Ideally strategic planning for information technology and systems should become an integral part of the overall business planning process and such a strategy should be an appropriate response to the strategic needs of the business. As noted, the strategy formulation and planning activities will themselves need management and the typical arrangement is a management steering committee that will solicit feedback and reconcile the supply and demand supply issues that will arise from time to time. This may or may not marry well with organisational culture. A committee will not be the best approach in a progressive, process-oriented organisation. There, a process manager (possibly seconded on a rotating basis) would be a more appropriate arrangement.

Setting priorities

Prioritisation of investments is a real challenge. Short-term business pressures change, projects will not proceed as planned, resources will not be available as expected, new opportunities and requirements will emerge. Each of these can change our priorities and therefore we must be careful not to over-commit to

particular schemes of work. There will always be a need to be flexible to account for shifting needs.

The applications portfolio provides a consistent and appropriate way of assessing the benefits, and therefore it helps with prioritisation by dealing separately with each of the four segments. Before we get too involved in that, consider the three factors that need to be included in the assessment of priorities:

- **What is most important to do:** Different benefits will determine what comes to the top of the list, in the first instance. Strategic information systems clearly deliver the most *potential* benefits, but key operational systems deliver the most *current* benefits, in terms of revenue generation through efficiency and cost reduction.

- **What is capable of being done:** Resources must be available and where there are special skills needed, or where special infrastructure is needed, it may be necessary to push some options down the list to make way for projects that are do-able within immediate timeframes. Strategic projects make special demands upon management and upon those directly involved with the project, if only because of the urgency to get them completed. Support projects can be relegated to the department concerned: if they have no capacity to deliver or implement, then it is of little consequence because they are the only ones involved.

- **What is likely to succeed:** All projects carry risks and checklists of risk factors are readily available. The main risk factors are concerned with project size and duration, business instability, organisational rate of change, the number of parts of the organisation involved, and technical factors where new technology is being used. High potential projects are especially risky, which is why they need a champion who is willing to put their reputation on the line.

Prioritising within the portfolio segments

Support systems

Within the support segment, setting priorities should not be too difficult - those with the greatest economic benefit using the least resources should get the highest priority. This will encourage users to express benefits quantitatively and look for resource efficient solutions, such as packages, to obtain a priority. The main argument for such systems is improving efficiency, which should be possible to quantify and convert into a financial argument for investment.

If a support system requires the use of scarce (central) resources, it is reasonable to expect potential benefits to be laid out before resources and costs are incurred, to identify the most economic solution within the benefits achievable. If one proposed support system is competing with others for limited resources, then it must show a good economic return for the allocation of a scarce resource. If, however, the project can be carried out within the

user department's control, then it is reasonable that the department should decide and even provide the budget. In this case, the investment is an alternative use of local funds and is not competing for scarce IS/IT resources from the centre.

Key operational systems

Key operational systems are not difficult to understand, because they underpin the routine value-generating activities of the organisation that should be its greatest strength. They will normally take a high priority – certainly higher than support and high potential systems. Setting priorities for key operational systems is more problematic than for support or strategic systems because the rationale is more complex. The arguments for key operational systems will be based on economic considerations, risks to current business operations, the achievement of critical success factors and infrastructure improvement.

Unlike strategic systems, all the costs and benefits of a new key operational system should be well understood and should reduce easily to financial terms, but this may not allow for all the arguments involved. The most economic solution may not be the most effective. Financial benefits are not the only driving force, and a feasibility study should examine the best balance of cost, benefit and risk. If a key operational system fails then the business will suffer.

It might also be worth exploring more integrated solutions than are first proposed to meet a wider range of needs more effectively. Integration is also an important factor in enabling the development of strategic applications that sometimes feed off high volumes of operational data. In this case the relationship of a proposed system to others must be evaluated for the contribution to the intangible benefits, those that might most effectively address critical success factors such as customer retention and improved supplier management.

Strategic systems

Those strategic systems that will contribute most to achieving strategic business objectives and use the least resources should go ahead first. A simple decision table can be useful in assessing the strategic contribution of different systems, expressing each in terms of the critical success factors it addresses. This produces a strategic score, or value, for each application. While critical success factors cannot be weighted, the associated business objectives can be given relative priorities. The argument for every strategic system should show clearly how and to what degree it will address critical success factors.

Strategic applications are essential to achieving business objectives and strategies. It is important to try to estimate costs and benefits to construct a financial justification, but the main arguments for proceeding are likely to remain intangible: the critical success factors that the application addresses.

This is a situation where a detailed discounted cash flow analysis will make no sense.

Achieving the benefits of strategic applications is partly a question of luck (that the target does not move), partly of judgement (the quality of senior management's business acumen), and partly good management of the application development.

The key issues are:

- whether the management team is united in endorsing the project;
- whether the organisation at large has agreed that the investment is worthwhile;
- whether the implementation can be resourced to achieve its objectives in the expected timescale.

This may need repeated senior management intervention to ensure both user and IS/IT resources are made available.

High potential systems

Like strategic applications, high potential applications should show a relationship to objectives and critical success factors, albeit one that is less clear. Setting objective priorities on scanty evidence is not very reliable but if an idea potentially addresses many critical success factors and clearly stands out it should be elevated above the general scramble for development resources. Because it is reliant upon the energy and enthusiasm of its champions, the prioritisation and resource used by a high potential application is in effect self-managing, although essential secondary resources can be a problem. The results will depend not only on the value of the idea, but also the force with which it is pursued.

The very essence of high potential projects is that the benefits are unknown: the objective is to clarify them and assess them. It is the "R&D" segment of the applications portfolio model and should be justified on the same basis as any other R&D project. Any funding that is needed should come from a general R&D budget rather than central systems and infrastructure funds: this kind of activity can become a bottomless financial pit if it is not monitored properly, and in the end it is the energy and commitment of those championing the idea that will win through: the role of the champions is critical here. They can be made responsible for their high potential projects, given a budget (even an arbitrary one) and a brief to deliver results against strictly fixed timescales.

Evaluation of ideas is what the high potential segment is really about - nothing should stay in it too long or have too much money spent on it. When initial allocations are used up, further funding would depend strictly on demonstrated results, not just allocated in the vague hope of eventual success. However, it should be obvious that high potential projects are a main feed to strategic applications. There need to be very clear processes that assess high potential

projects and allow them to be promoted to the strategic quadrant, or (in the majority of cases) relegated to the scrap heap.

The question of infrastructure

Information technology infrastructure is the means whereby systems are developed and operated. It includes the computer equipment, software, networks and people who are all essential to the delivery of systems capability. It also includes common elements of all kinds, such as standards, quality control and project management.

Some applications lead to a direct requirement for new infrastructure. In other cases the sum of several applications makes an infrastructure investment necessary. For example: a new network that will link all offices and provide a vehicle for different applications to be offered at all of those locations, or a new customer database that will service marketing, sales and customer service applications. Infrastructure is important in developing a coherent systems and data architecture, increasing skills, improving the resilience or flexibility of systems and the technology base. This will both avoid excessive costs in supporting the systems and also provide a firm foundation for strategic developments.

We will therefore become involved with evaluating and prioritising infrastructure projects as well as applications projects. Risk to current business could be assessed in a similar way by asking 'what risks do we run if the infrastructure project does not go ahead?' In general, the priority given to an infrastructure project is influenced by all the applications that it will support or contribute to.

In practice of course it will be found that no particular part of the business will want to pay for shared infrastructure, but the costs must be shared. That means that there must be central funding for infrastructure and – in those organisations working with cost centres – there must be a charge-back mechanism that relates to infrastructure use. Budgeting for infrastructure is often the source of much contentious argument, and clear policies and firm management is needed.

Summary

Every organisation that wants to benefit from information technology related investments needs a strategy to assure success. For different kinds of organisation the approach to strategy will be different, especially when comparing a small, fast moving business with a large, mature multinational business or a body responsible for public administration. Strategies must be driven by business requirements not by technology opportunities, they must recognise priorities according to the benefits that each new information system will deliver, and they must be set to appropriate timeframes that reflect the business planning horizon - this can be five years or more in a stable business, but may be only one to two years (or even months) in a volatile one. In most

businesses a two to three year plan would be most appropriate but timescales have been shortening as businesses become more adept at managing change.

Strategic analysis tools

So, we have looked at the context for strategic planning for information systems, and we have a feeling for the process of analysis, especially in the sense of "*Where are we now?*" "*Where could we be?*" and "*How will we get there?*". The next question that arises is: "*How shall we undertake the necessary strategic analysis, in terms of the specific tools and techniques that are available to us?*"

In the notes above there has been more than a hint of value chain analysis, process analysis, and portfolio management. In the notes that follow a selection of strategic analysis tools is described and explained. Bear in mind that there is a much wider selection of tools than is given here, but these are some of the most important to the strategic management of information systems in business and provide more than enough scope to get started. There is copious literature about the general use of strategic analysis tools such as these, our purpose here is to highlight the application of the tools in analysing information systems strategies.

The table below lists the tools and positions them according to where they contribute most to the cycle of analysis and according to the level of application:

- **Strategic drivers:** here we need tools to identify the strategic forces that are bearing upon our business.
- **Value analysis:** at the next level we need to understand the way in which value is delivered in our industry, and in our business.
- **Business modelling:** as we move towards operational considerations we must understand how the business works and, if at all possible, the extent and the quality of the information that it is working with.
- **Portfolio management:** this gives us a simple but very effective overview of the benefits that will be delivered to the business, with risks and timescales.
- **Implementation:** finally we need tools to assist in the planning of implementation.

Generally we would expect to work from the left of this table to the right (across the columns), but in practice strategic thinking tends to be somewhat sporadic and we must expect to move from one area of concern to another quite quickly, especially in conversation. Our level of concern (down the rows) will be determined by the role that we fulfil in the organisation as well as the stage that has been reached in the analysis.

Level	Where are we now?	Where could we be?	How will we get there?
Strategic drivers	SWOT (STRENGTHS WEAKNESSES OPPORTUNITIES and THREATS); FIVE FORCES		CRITICAL SUCCESS FACTORS
Value analysis	EXTERNAL VALUE CHAIN	EXTERNAL AND INTERNAL VALUE CHAIN	INTERNAL VALUE CHAIN
Business modelling	STAKEHOLDER ANALYSIS (FIVE FORCES)	PROCESS and INFORMATION ANALYSIS	
Portfolio management	APPLICATION PORTFOLIO		
Implementation			PROJECT and CHANGE MANAGEMENT

Strategic tools organized by sequence and level of application

SWOT
(Strategic drivers: Where are we now? Where could we be?)

The analysis of strengths, weaknesses, opportunities and threats is one of the most straightforward and frequently deployed techniques for strategic analysis. It deals well with the internal issues (strengths and weaknesses) and the external issues (opportunities and threats). For our purposes, the latter (opportunities and threats) is probably the most useful to start with because understanding the external situation gives a context for internal assessment, although it is common to start with the former (strengths and weaknesses) as in the case of the example illustrated below, a SWOT analysis for a university. This is a somewhat reduced version of the original, which had more detail and some very specific comments about particular strengths and weaknesses, but it illustrates the sort of results that will come from a SWOT analysis.

Strengths and Weaknesses

The internal view of the business is concerned with what is being done well, and what is being done badly, also, with strong capabilities and relevant resources, and those that are absent.

Perhaps the most obvious starting point is to consider the state of the establishment. How well trained are the people who are working for the organisation? Is the average age of employees so high that there will be a problem in maintaining numbers, or does this represent an opportunity to refresh the workforce with some new, young blood? Then there is the question of the resources that people have to work with. Is the equipment up to date and appropriate, or is it deficient? Do people have the information that they need to do their work effectively, and is there a culture that would welcome change or resist it? Finally, what is the state of corporate policies, procedures, and business systems? Are they aiding the organisation to move forwards, or are they a hindrance? Many of the organisations that invested heavily in information systems in the early days, the 1960s and 1970s, now

find that many of the systems of that time are still working, but nobody can maintain them easily and they are holding back progress.

SWOT analysis for a University	
Organisational strengths • Pockets of excellence from which comes growth – especially in research. • Innovative courses that help to redefine our role in the marketplace. • Potential for growth. • Foreign liaisons with overseas institutions. • Low cost options relative to other institutions. **Information systems and technologies strengths** • Campus networking is good. • Potentially useful initiatives for e-Learning • Homegrown open source web-supported learning environment.	**Organisational weaknesses** • No mechanism to manage growth. • Poor library resources, especially in regard to electronic journals and bibliographic services. • Under-investment in research. • Lack of funds for the academic use of information technology. **Information systems and technologies weaknesses** • Ineffective existing systems, especially budgeting and financial management systems. • IT Services are not defined and generally are not the subject of service level agreements. • Systems are outdated, no mechanism to establish users' requirements and deliver solutions. • Few standards and inadequate policies and procedures. • No project management discipline and projects routinely fail to meet deadlines.
Organisational opportunities • Adopt a fresh approach to curriculum design, teaching, learning, and research. • Embrace the enthusiasm and energy of students and use it to further the development and improvement of the institution. • Broaden the basis of competition (for the best students) on the basis of academic quality and value-added to students. • Work academic partnerships more effectively, especially the international ones. **Information systems and technologies opportunities** • Improve organisational performance through the effective deployment of IT. • Rebalance budget allocation to improve systems support for academic activities. • Support and encourage use of in-house open-source learning management system.	**Organisational threats** • Rise of the private higher education sector in South Africa • Emergence of technology-based education products and services. • Falling supply of suitable applicants and falling pass rates. • Information systems and technology • Further reductions in Government spending. • Failure of the current school system to qualify candidates. **Information systems and technology threats** • Inadequate progress with technical infrastructure in comparison with other local tertiaries. • Failure to meet the operational standards required by national government. • Failure to meet expected quality standards through a lack of a quality management system

Opportunities and Threats

The external view of the business is concerned with competition and industry trends, and with new opportunities that are only just on the horizon but already waiting for a progressive organisation to seize them and make new ground.

There is a specific approach to external analysis that is both popular in its own right (it is not always associated with SWOT analysis) and easy to understand and adopt – it is known as the "Five Forces" analysis, and it was promoted in the 1980s by Michael Porter (at the same time as the Value Chain idea) as a means of competitive analysis.

Critical Success Factor analysis (CSFs)
(Strategic drivers: How shall we get there?)

Critical success factors are those things that *must* go right if strategic objectives are to be achieved. As we move towards completion of the high level strategic analysis we will have a view as to where we are and where we want to be, and therefore the question of what is critical to its achievement should come easily.

Supposing that we have decided to differentiate competitively through a high level of customer intimacy: it will be critical to success that we have an effective customer information management system with appropriate database capability and operational procedures. These requirements can be embodied in critical success factors:

- Customer information must be acquired and managed.
- Supporting customer databases and systems functionality must be in place.

And so on, as needed. The important thing to realise (and one of the original considerations that led to the development of critical success factor management techniques) is that these requirements are generally seen to stand above financial arguments. If improved customer relationship management is what we have decided to do, then it *shall be done*, and requisite supporting actions must be taken. There is no attempt to make a financial case. The strategic investment is justified through simple logic, not by arguing that within seven years, at a fixed rate of return, there will be a net positive financial outcome. Organisations that insist on a financial case for investment will always lag behind organisations that have found a way to make strategic investments independently of financial returns, and the use of critical success factors is one way to achieve this.

An example

From each of the general strategic objectives that are agreed, specific critical success factors can be developed. For example, in the case of a petroleum company that wishes to be a leading retailer of petroleum products and aims to share the rewards with shareholders, employees and customers, it might have objectives such as:

- to achieve 2% improvement in market share;
- to extend outlet coverage in defined geographical areas;
- to increase sales of non-oil products in existing outlets;
- to reduce costs of distribution by 5%.

Following through the example, critical success factors for the first objective (2% improvement in market share) might be:

- effective regional and local pricing;
- increase consumers' brand awareness and loyalty;
- improve non-oil product range to attract customers;
- review all sites in terms of performance and productivity;
- ensure lead free petrol demand is matched by supplies at outlets.

Critical success factors must be derived from the agreed objectives, and then they must be used to identify the key actions required and to set targets. There should not be too many for each objective otherwise the objective is effectively unachievable (five to eight critical success factors per objective would be typical). Note also that critical success factors can recur across objectives, thus giving them a heavier weighting and requiring that critical success factors across all objectives be consolidated.

Implications for information systems

Having established critical success factors there are consequences for information systems.

- First, all critical success factors will require measures to be implemented within the management information system, to monitor their achievement. If something is critical to success then management will require feedback on progress towards its successful achievement.
- Second, critical success factors may also require systems enhancements or completely new systems. For instance, given the third critical success factor in the illustrative list above (improve non-oil product range to attract customers), it is necessary that sales of non-oil products be recorded and analysed in a consistent way. A new system to achieve this will be needed.

Once defined, critical success factors may also be mapped to the activities in the business. Hence, in conjunction with other techniques critical success factor analysis can help to focus attention on the information systems contribution. A high cost activity in the internal value chain that adds considerable value *and* addresses many critical success factors is more critical than a low cost, low value added, "critical success factor free" activities. It therefore qualifies for higher priority information systems investment.

Other notes on critical success factors

Note that in large organisations there can be a cascading relationship between objectives and CSFs. Corporate objectives will have certain related CSFs, which may in turn be the source of some business unit objectives, which produce CSFs, which drive functional and departmental objectives. Ultimately, operational objectives at all levels determine critical (career) success factors for employees.

As the business objectives change over time, so will the critical success factors, and hence information systems needs and priorities. The analysis can be revisited regularly and existing priorities can be reconsidered if any of the critical success factors change for any reason. This provides a useful way of stimulating evolution of information systems strategy from a business perspective, and makes systems-related decisions more reliable.

Value chain analysis

Value chain analysis helps to analyse the role of information in a business and in the industry within which it works. It can reveal important aspects of relationships between organisations and in the business itself, identifying information that is needed, where it might come from, and also how information systems might affect the competitive positioning of one organisation and another. It helps to establish a position relative to customers, suppliers and competitors and how that position can be enhanced and sustained within the industry structure.

In its earliest form value chain analysis was intended to help define business strategies in terms of how a business adds value and how it incurs cost. It was seen at first as applicable to just one organisation but later the idea of *industry* value chain analysis emerged. The organisations involved in an industry value chain each consumes different resources to produce value; however, this value is only realised when the evolving product or service is acquired by the organisation at the next stage in the chain. The difference between realised values and actual costs is the margin of profit.

The Value Chain

Secondary Activities	Corporate Infrastructure
	Human Resource Management
	Technology Management
	Procurement
	Information Systems

| Primary Activities | Inbound Logistics | Operations | Outbound Logistics | Sales and Marketing | Service |
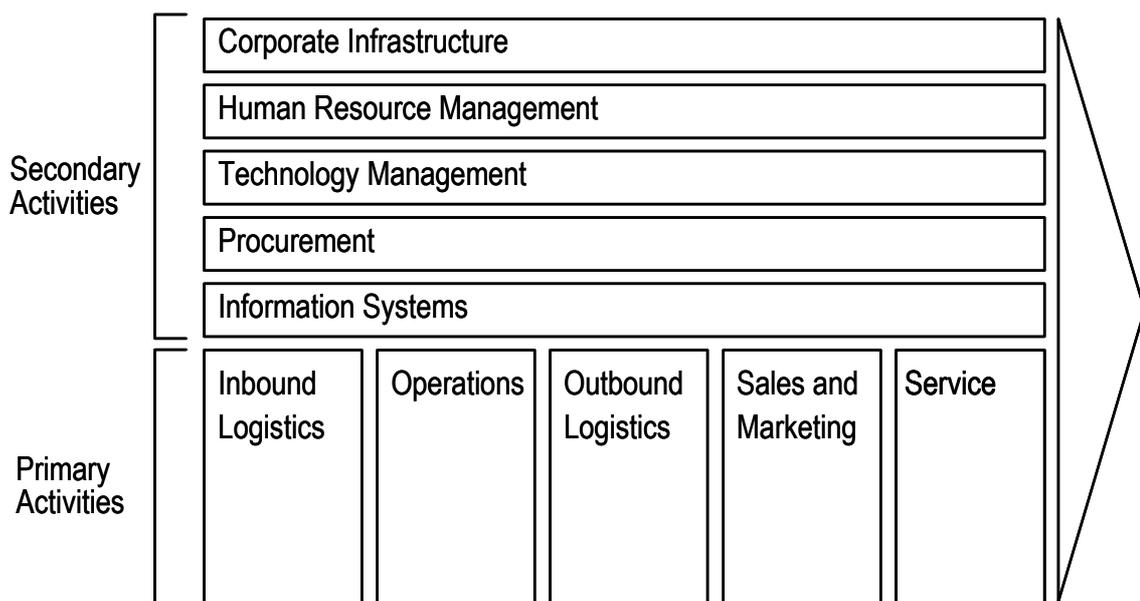
Internal value chain

The internal value chain shows how the various activities and functions in a business unit contribute to the customer's requirements, and how costs are incurred in so doing. Understanding what is done, how it is done and how business activities are related leads to a better understanding of information and systems needs and opportunities. The value chain helps to get beyond the detail of current arrangements in order to see the bigger picture in relation to the whole business and the way that customers see it. The original value chain model was based primarily on manufacturing business, but its structure can be applied to most other types of business. The model identifies two different types of business activity - primary and support - and provides a framework for organizing the detail within them.

Primary activities, in the lower half of the figure (above), fulfil the *value-adding* role of a business. These primary activities must each be optimised individually and the whole linked together if the best overall business performance is to be achieved.   They occur in five groups, generally considered in a sequence from the supply side (at the left) to the customer side (at the right):

- **Inbound logistics:** obtaining, receiving, storing and provisioning key inputs and resources required by the central operations of the business. This can include recruiting staff, buying materials and services, and dealing with subcontractors.

- **Operations:** transforming inputs of all types into the products or services to meet customer requirements. This involves bringing together the requisite materials, resources and assets to produce the right quantity and quality of products or services - for instance in a university, delivering the courses in the prospectus and examining the students.

- **Outbound logistics:** distributing the products or services to the place of sale, or to customers directly, using channels of distribution by which the customer can obtain the product or service and pay for it.

- **Sales and marketing:** making customers and consumers aware of the product or service and how they can obtain it; promoting the products in a way that persuades the customer that it satisfies a need at an appropriate price.

- **Services:** adding additional value for the customer at the time of sale or afterwards, for example by means of financial services, user training and warranty claims processing .

Support activities are those required to control and develop the business over time, and to facilitate the working of the primary activities. They do not add value directly but only through the enabling of primary activities. Examples are: accounting, personnel, information systems, research and development, property management and legal services (see the figure above for more examples).

In the simple case a business does not always have much choice over what its actual primary activities are, since they are heavily influenced by the nature of the products, customers and suppliers in its industry. What is critical is how well it carries out each activity and how it links the activities together, so as to maximise the margin between value-added and costs incurred. Information intensive activities such as forecasting, capacity planning, scheduling, pricing and costing must be linked throughout the chain if each stage in the internal value is to make the best contribution to the overall result, and must be served by effective information systems.

On the other hand, a business *does* have control over how it carries out its support activities. They can be shared centralised services used by all business units or delegated activities within each of the units. It is a matter of choice, bearing in mind the need for managerial consistency across the units, and the particular business situation and unique aspects of each unit. Either way, the support activities have two main contributions to make:

- To enable the primary activities to be carried out at optimum performance levels, for example by providing required services or by the development of new products, technologies or resources to meet current and future business needs.
- To enable the business to be controlled and developed successfully over time, principally through support for the management and through improved methods of planning and control.

Support activities that are not well managed themselves can actually disrupt the smooth running of the business by spreading their tentacles of control throughout the primary activities – marketing people have been heard referring to the 'sales prevention system', no doubt in other business areas similar remarks might be heard. Good information systems to serve the value-adding and supporting activities of a business is what this is all about – not localised systems that serve the needs of a single department or division. The value chain helps us to see the big picture.

As noted above, Porter conceived the value chain in the context of manufacturing industry. It is surprising that the literature tends to ignore its adaptation and application to other industries. In the service industries the key value adding operations may be less obvious but it is therefore even more important to reveal them. In a home loans operation, for instance, customer savings and mortgage lending can be seen as different businesses that relate to each other only through the use of available funds. On the other hand, savings can be seen as inbound logistics (getting the money in) and mortgages as outbound (putting the money to work) while funds management constitutes the central core activity. In a more modern, progressive financial services operation where the service is total asset management, the inbound logistic becomes something else altogether: information about the client and the profile of investment needs that the client desires; the outbound logistic is a personalised portfolio of investments that will deliver the right balance of

income and capital growth, and the right balance between risk and return. We will return to some of these ideas when we discuss business strategy.

Use of the internal value chain

It is important to understand the cost drivers in a business and why and how they are managed. The value chain model offers a useful way of identifying these drivers and allocating all the real costs in order to identify where savings can be made, and where performance needs to be improved. Continuing investment in one area (for example manufacturing productivity) is pointless unless other areas are improved (such as sales forecasting and inventory management). All costs derive from activity of some kind and every activity should be adding value, either directly or indirectly. If it is not, then it should be eliminated, not computerised.

From an information systems perspective the internal value chain is a valuable way of identifying where better information and systems are needed, especially to show where integration through linked systems could provide potential advantage over competitors (or reduce current disadvantages). A logical approach to identifying how IS can improve the business is:

- Improving relationships with customers and suppliers in all aspects of their interface with the organisation (for example through better integration of customer information).
- Improving the critical information flows through the primary activities, removing bottlenecks and delays, and ensuring the accuracy and consistency of information used (for example total stock management, customer service monitoring).
- Improving the systems within each primary activity to achieve local improvements in efficiency (for example warehouse control, fleet management).
- Improving the way support systems can best assist the primary activities, as well as meeting central requirements (for example budgetary control, personnel data).
- Improving efficiency within the support activities by means of localised systems investments (for example financial consolidation, asset management).

This may sound perfectly logical because it is driven from the outside of the business and it deals with the *critical* parts of the business before the *non-critical*, but it is almost completely the reverse of the approach that has been taken over the last thirty years. The result is that small armies of people (often 10-20 per cent of all the 'white collar' people employed) sit at the boundaries between business activities and systems operations, reconciling information and analysing the differences between the two. Not conducive to improved business performance; there is scope in most organisations to radically improve these interfaces by using more appropriate information flows

and by re-defining the ownership and use of information. This will not only save money, it will improve the ability to add value.

Using value chain analysis will assist management to ask searching questions about the strengths and weaknesses of existing systems. It will identify key areas for future investment, especially by the integration of organisational activity. Key aspects of the method of analysis are:

- It reinforces the business unit approach to assessing business requirements and therefore makes better links to business strategy.

- It is independent of the current organisation structure and clearly separates primary and support activities in terms of criticality of systems needs.

- It concentrates on why the business is there - to add value to satisfy the customer - and this enables more focused questions to be asked about the activities and systems, such as: How can it be done better, or cheaper, or both? Do we need to do it at all?

By considering the way information flows through and is used by the business, and having regard to the external industry value chain, an organisation can identify those parts of the business and its external relationships that can be improved by better information systems.

This is a high level of analysis that helps to avoid irrelevant details and maintains a view of the wider picture. Without this 'big picture' we can be certain that lower level analysis in confined areas of the business will only provide partial solutions, sub-optimisation and an ineffective use of analysis time. With the 'big picture' to hand, however, we can direct detailed analysis more effectively and maintain the coherency and completeness of our business models at all levels.

An example

Value chain interpreted for a typical DIY retailer
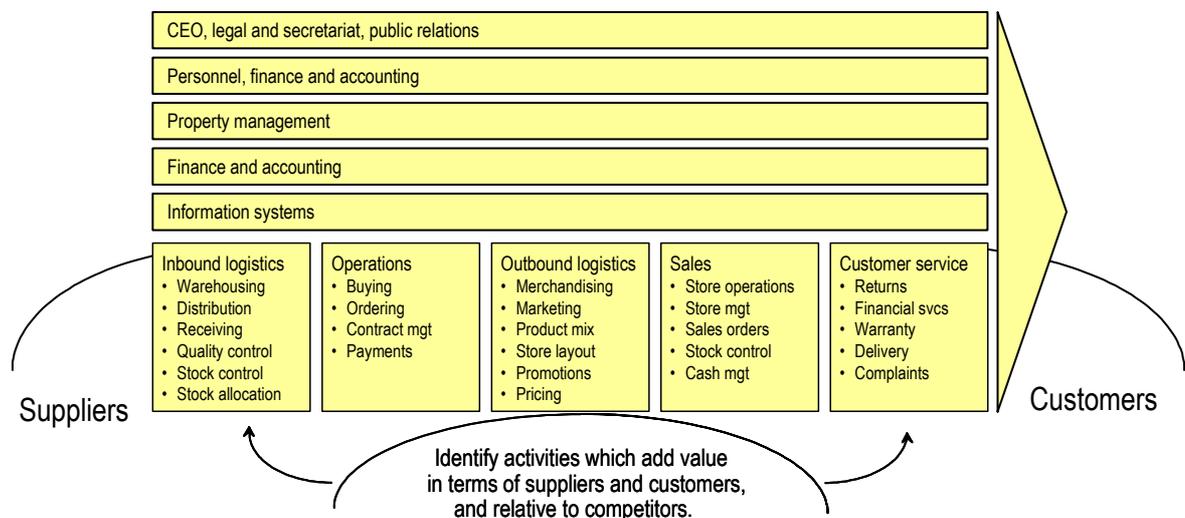
The adaptation of the generic value chain to show the specific detail of a typical DIY retailing organization is shown in the figure above.

This figure shows how the generic groups can be re-interpreted and re-defined to provide a specific model of a non-manufacturing business. The groupings differ from those above but the rationale of the structure is consistent in terms of the supplier-to-customer linkage.

Deciding whether to view the primary parts of a business separately or together can be assisted by value chain analysis but it will not 'automatically' produce a decision. The value chain is just a vehicle for exploring options and understanding consequences: it helps to shape a discussion rather than prescribe a solution.

Industry value chains

For every industry there is a value chain that shows how an end product (or service) required at the consumer level is developed from raw inputs. The chain is a series of industrial stages, such as raw material extraction, processing, manufacturing, distribution and retailing. Each stage adds value but incurs cost, and the *difference* between value and cost is the focus of our attention in the simple case. Where ever there is a stage or an activity where cost exceeds value added, then management needs to ask whether costs could be reduced, or whether a third party with a lower cost base needs to be brought in because they have economies of scale or scarce skills that are not locally available. Transportation is a good example. At one time many businesses maintained their own fleets of trucks but had to suffer low levels of utilisation and high fixed costs. Over recent years there has been a general move to employ the services of external trucking businesses where loads are managed more effectively because of the dispersed, high levels of demand that arise from a combination of trucking requirements. Some of those trucking businesses have even been persuaded to have their vehicles carry the livery of a manufacturing company, irrespective of what was being carried in the trucks.

Supply chain as an example

See the figure provided below. This is a simple representation of a three-stage industry value chain where a major chemicals company provides the key requirements for the manufacture of household cleaning products; in its turn, the manufacturer supplies a retailer who supplies the general public. As we shall see, this is a dramatically simplified view of something that is actually much more complicated, but we can use this figure to make a simple point. Demand is generated at the consumer level, and is communicated down the supply chain (from the right to the left) in different ways. According to the perception of requirements, the retailer will issue replenishment orders, the manufacturer will issue raw material orders (the blue arrows) and stock will move in the opposite direction (red, from left to right) to fulfil demand.
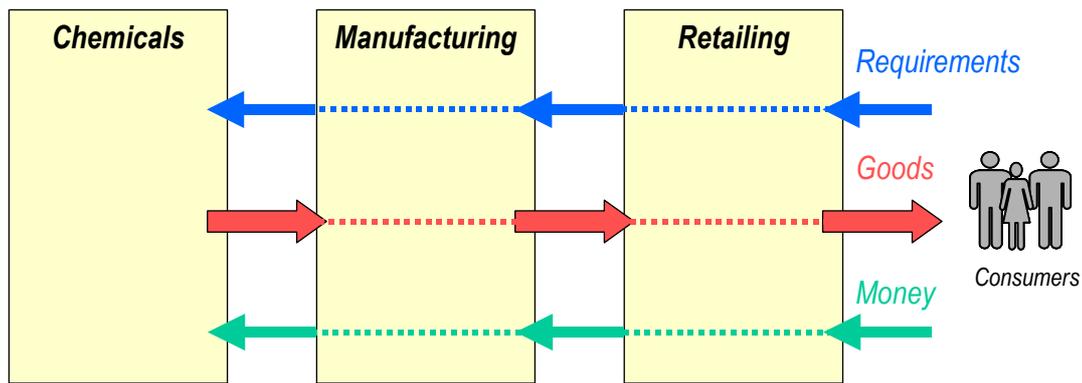
Finally (and this is a feature of supply chain management that is often ignored) payment must be made for goods and services rendered, so that money flows back down the supply chain (green, from right to left) to reward all those involved in the delivery of value, of any kind. In this way, every supply chain involves the movement of information, goods (or services) and money. It is the balance between these three, as seen at each interface, which must be understood and managed well.

Supply and demand must be matched at each stage of a value chain in order to provide the required product or service at an appropriate cost. Within any industry there is a finite demand in terms of how much of the product is required and how much will be paid for it, and also at any time there is a finite supply of materials and resources to produce the product or service. Organisations compete not only with companies doing much the same thing but also with others along the chain for a share of the revenue and overall profit available within the industry. That overall profit can be increased if demand and supply can be matched more accurately throughout the chain. Any business that operates at some distance from the final consumer demand, or from the supply of key resources, has to deal with considerable uncertainties and will find it difficult to optimise its performance. If relative to its competitors it can capture better information about supply and demand, it can optimise its performance more effectively than its competitors, who will face greater uncertainties.

This industry-level view of information highlights the key flows of information that the business needs to intercept and influence. It provides a basis from which internal information systems needs can be assessed and defined in more detail, but complexity can be a major issue. Many industry value chains are very complex and involve manufacturers, distributors, service providers, sources of skilled staff and capital as well as resources such as equipment and buildings. It is not necessary that a detailed model of all elements is produced but an appropriate level of working must be found. At the industry level, the activities that actually link one business to another must be identified but the internal activities might be ignored.

A three-stage supply chain for the supply of floor cleaner:
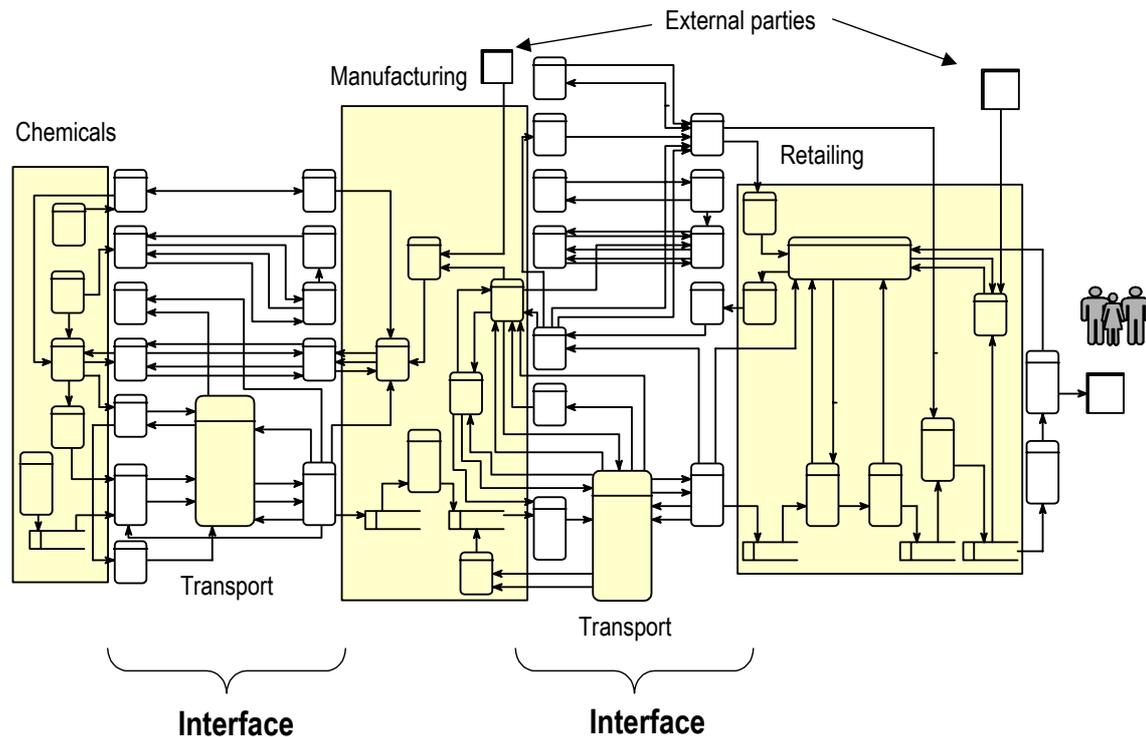
See the more detailed model of the supply of household cleaner shown here. No attempt is made here to identify every one of the activities and information flows involved, but it gives a visual impression of the two key interfaces and the complexities involved.

What was learnt from the full analysis of this case study was as follows.

- For each movement of goods, there are about eleven movements of information.

- There are seven points at which the raw materials or the goods come to rest, awaiting a management decision or other action.

- The cost of administering the two interfaces was of the same order of magnitude as the profit margin available to be shared between the three players.

- A 25% reduction in costs was immediately available by simplification of information handling procedures between the three players and the introduction of appropriate information systems (principally in this case for electronic data interchange – essentially doing business the same way but more efficiently: eliminating errors, queries, and other exceptional activities).

- A further reduction in costs of 20% was available through redesign of the interfaces (changing business practices to incorporate automatic replenishment, automatic payments, and so on).

- A major reconstruction of the supply chain in accordance with progressive thinking at the time brought administration costs to under half of the

existing level and allowed much more effective stock management and faster stock turn. This third stage of improvement was based on the manufacturer retaining ownership of the stock right through to the point of sale. The retailer never owns the stock, and many of the business activities and costs that would otherwise have prevailed simply fell away.

Complexity in industry value chains

There is a continuous exchange of information going on throughout any industry chain but a single business is only a part of the whole and therefore has only a limited view. The examples presented here are grossly simplified, partly because they ignore the internal activities of industry players but more importantly because they ignore the fact that any single player will have *many* supply-side partners, and *many* customer-side partners. It is common to depict a supply chain as a "string of beads" suggesting singularity all along the line, and omitting altogether the critical flow of information and money that must accompany the movement of goods. Supply chains are complex, and over-simplification is a dangerous practice.

A large corporation may own businesses in more than one part of the chain - clearly such an organisation has major opportunities to gain advantages over more focused rivals by sharing information or by developing effective inter-company trading systems. However, in large corporations that are managed on profit-centre lines, the links between divisions within a single firm are often considered to be external and this makes it harder to implement integrated systems. In other cases unitary companies work strenuously to develop close partnerships with their partners because they know that there are significant mutual advantages to be gained by firms linking their information and systems throughout the chain, irrespective of ownership.

Potential benefits of management of the value chain

A number of long-term benefits arise from careful attention to the management of the value chain, as follows:

- Given that at any time the industry can generate a certain amount of net profit, then that profit can be shared advantageously among the various organisations in the chain. The advantage will most likely accrue to the player that pays most careful attention to the way that the industry value chain works.

- Where demand and supply can be matched more accurately through appropriate information exchange or sharing, inter-organisational systems have a special contribution to make to overall efficiency and effectiveness, and the potential for profit sharing increases proportionately.

Clearly, there are different kinds of relationship that might prevail, from raw adversarialism (where industry players fight only for self-interest) through to heavyweight risk- and profit-sharing, where two or more players work together very closely to understand and optimise a more holistic view of the value

chain. In between, the co-operation of suppliers or customers to provide information in exchange for some benefits allows different levels of partnership, possibly including transportation service providers and banks, where they are substantially involved, and where potential efficiencies are evident.

Where rival firms are competing for the same suppliers, customers and industry resources their position will be weaker. Suppliers prefer to sell to a partnership where there is some assurance of continuity of demand and more profit, even if discounts have been negotiated. Prices in rival firms will have to increase or service levels will reduce if they are to achieve the new level of profit available to a closely negotiated partnership. Equally, customers will prefer to buy from a negotiated partnership because of the lower overall cost of purchasing and will begin to demand lower-priced products and better service levels from those rival companies that they still trade with.

In the best case the net result is that rivals face increased costs, poorer supply-side service levels and lower sales revenue, at the same time that their customers demand higher service levels. This leads to a long-term, sustained disadvantage for those outside partnership arrangements.

Gaining the benefits of information systems in the value chain

Consider the following further examples of industry level co-operation that delivered real benefits:

- DIY retailers have adopted joint stock planning and optimised delivery logistics with their suppliers. Suppliers who cannot or will not co-operate have to find other outlets for their products.

- A major oil company operates a joint stock management system with its main steel supplier at its North Sea depots. The stock belongs to the supplier, but is used as and when required by the oil company and paid for as used - forecasts of demand enable the steel company to maintain appropriate stock levels at the depots.

- Retailers have installed point-of-sale systems that monitor exactly what is bought and when, enabling them to hold the ideal range and quantities, and demand just-in-time replenishment by suppliers. Some of the information is of course extremely valuable for market forecasting purposes and can be sold to intermediaries who specialise in forecasting services.

- Where at one time a disappointed customer would simply walk out of a shop frustrated, (leaving behind a frustrated sales assistant) online cataloguing systems let retailers find out directly about customer requirements. Web-based sales systems can monitor demand independently of actual stock availability and identify the unfulfilled demand (or 'lost sales') that they need to know about as market trends shift.

- A kitchen manufacturer built excellent internal systems that enabled it to outperform its rivals in terms of internal efficiency. However, consumers had to deal with retailers who worked through distributors, that in turn

bought from the manufacturer and the advantages of internal efficiency did not materialise until retailers could place orders direct with the factory using additional systems facilities.

- A European timber importer found that the number of housing starts in the United States (mainly timber framed houses) determined demand (and therefore prices) for Canadian timber. A model was built which monitored the number of housing starts in the United States and successfully forecast likely timber prices several months ahead, giving the importer a distinct advantage when negotiating supplies.

- A lighting company provides architects an information system to help design lighting systems. Architects do not buy the lighting systems of course, but influence contractors who buy from wholesalers, who in turn buy from the manufacturer. By providing the new system the lighting company can ensure that its latest products are specified and thereby tightens up the whole chain in its favour.

The benefits of information systems investments can be seen clearly in the context of the industry value chain by consideration of any one interface between two of the main players in the chain. The basic relationship is that of buyer and seller: placing orders, taking delivery, checking details, raising and dealing with queries, and financial settlement. Some information exchange is clearly essential, but there is in practice a great deal of ineffective information exchange. Where inaccuracy creeps in, or where information is not available when it is needed, decisions may have to be made that are inappropriate. When goods are ordered that are not actually available, or when goods are delivered that were not actually ordered, the cost of correction can be many times the cost of doing business competently and accurately.

Costs can be reduced by doing business effectively (doing the right thing) and by doing business efficiently (doing things right). The trend towards information systems with broader scope and more significant benefits, through industry level co-operation and information sharing, has led to dramatically reduced operating costs and much wider choice (at the end of the day) for consumers. Consider that twenty years ago, consumers would typically have called in at five or six shops each of which might offer some hundreds of stock items, now they can call at one large scale supermarket that offers in excess of 30,000 stock items. This huge choice would simply not be possible without shared systems, electronic data interchange technologies, and supply chain optimisation on a wide scale. In this way, significant costs can be taken out of the industry value chain and each partner is able to perform more effectively than previously.

The benefits are mutual, in the most literal sense of the word.

Application to non-profit organisations

In non-profit making organisations such as public bodies, the direct relationship between revenue and cost may not be evident. Income is

probably indirect, through donations or taxation. However, there is still a value chain and the organisation's costs must be contained within the funds available. It may not compete for customers but it does compete for available resources, and the way in which information systems can assist through the improvement of value delivered is just as applicable.

Porter's five forces

Michael Porter's approach to the appraisal of competitive forces in an industry is based on five perspectives: the customer, the supplier, the whole of the existing industry, and the possibility of new entrants or substitutes (see the figure below).

Porter's five competitive forces

Threat of new entrants:
Can information systems build barriers to entry, or can superior use of systems ease entry?

Suppliers bargaining power:
Can information systems change the bargaining power of suppliers?

Rivalry among existing competitors:
Can information systems change the basis of current competition?

Customers' bargaining power:
Can information systems reduce the bargaining power of the buyer?

Threat of substitutes:
Can information systems generate new products or services that would replace those existing?

New entrants are those businesses that have not previously been operating in the industry (or in the particular market segment in question) but choose to make an entry in direct competition. An example is the case of retail petroleum sales in the United Kingdom, where the major retail groups all moved to start selling petroleum at their major stores, at a lower price than at the traditional petrol service stations. They did it very well: huge buying power, general retailing competencies and the combination of weekly grocery shopping with "filling the tank" made a lot of sense to the motorist and to the motorist's family.

Substitutes are different, where a completely different product or service is successful as a substitute for an existing one. An example here might be the widespread adoption of data projectors as a replacement for overhead projectors. Although the purchase price is much higher, the cost of producing

quality acetates over a period of time and the convenience of producing and showing educational material electronically probably make the argument for change for most organisations that have some cash at hand to make the initial investment. Suddenly, we have the opportunity to manage teaching and learning material in a quite different way – it can be shared and maintained in a centralised library far more easily than ever before.

Obviously information systems investments are only one of many ways of dealing with the issues that arise from this kind of competitive analysis. Having ranked competitive forces in terms of intensity of impact and immediacy of threat, the most critical can then be considered in terms of how new systems ideas (perhaps in conjunction with other developments) could be used to gain advantage or avoid disadvantage. As is made evident in the figure, this requires that the capabilities and plans of customers, suppliers and competitors are all known, and that a watch is maintained on the horizon of competition and innovation.

The action required may involve two or more of the forces. For example, establishing barriers to entry might combine with increasing customer loyalty, increased switching costs and tying suppliers in more closely. This then makes entry more difficult. Note also that the relationship between a business and its suppliers and its customers is dealt with in detail through value chain analysis.

1 - Threat of new entrants

When new entrants threaten that additional capacity will be introduced into the industry, then the basis of competition may change and in the short term, at least, prices will be reduced. This can be counteracted in a number of ways by IS investments:

- Better control of distribution and supply channels to limit access.
- Segmenting the market to match the products of the business more accurately and providing a more complex target for the new entrants.
- Exploiting existing economies of scale more effectively to reduce costs in anticipation of a price war.
- Increasing the rate of new product innovation and development and/or differentiating existing products on quality or service.

In all these areas information systems can help by providing better information, greater efficiency and an ability to react faster, for example by the use of computer-aided design in product design and automated production control methods in manufacturing. The cost of the investment in systems will increase the entry threshold, as has happened over recent years in grocery retailing, travel and financial services.

2 - Threat of substitute products or services

The substitute may be a direct replacement (such as air for sea travel), or an indirect replacement in terms of customer preference (such as a holiday for a

new hi-fi). In either case the threat of substitution will take the market into decline and produce more intense price competition, especially where fixed costs are high. Again information systems can be used in a number of ways to counteract the threat including the following:

- Redefining market segments and products to match changing preferences and retain profitable areas.
- Improving the rate of product innovation to recapture preferences.
- Enhancing the products with new services to increase their perceived value.
- Improving the price/performance of the existing product by cost reduction.
- Identifying other new customer needs that can be satisfied, thereby exploiting the existing customer base to develop new products.

Of course it would always be better to stay one step ahead by using the information available to identify changes in customer needs, to be proactive in developing new products or services, and to increase the breadth and depth of the product portfolio.

3 - Rivalry among existing competitors

Where rivalry among existing competitors is intense, generally in mature and declining markets, the consequences are likely to be fierce price competition, increasing buyer power, more rapid product enhancement, and distribution and customer service levels becoming critical. These produce an obvious conflict in terms of cutting costs and increasing service levels. Without effective information systems costs can easily increase in such circumstances and service levels can decline - the wrong product available at the wrong place and at the wrong price. Whatever system is used for in this case, it must be deployed in support of the chosen business strategy - low cost, differentiation or niche marketing - in order to enhance that strategy effectively. For example:

- Identifying how IS can be used to reduce real costs across the board, in relation to competitors, in all activities and relationships in the business.
- Identifying how IS can enhance the type of differentiation sought, whether that be image, product quality, services provided - as perceived by the customer and end consumer.
- Getting close to the end consumer as well as the immediate buyer is important in order to understand their requirements and increase their loyalty and/or fear of buying less good products elsewhere.

Many retailers in highly competitive markets, such as clothing and DIY, have realised that product range, quality and convenience no longer provide sufficient differentiation to induce customer loyalty. Hence they have added further services to induce the customer to stay with them. Some of these, such as discount cards and personal financial services are wholly dependent on the availability of information systems and information about the customers: where they live, who they are, what they buy and when.

4 - Bargaining power of buyers and suppliers

Information systems can be used to improve the balance of power with buyers and suppliers in favour of the business.

When a supplier is in a strong position due to size, or the scarcity of what it provides, it can obviously increase prices, reduce the quality of what is supplied and make it less readily available. At best this causes uncertainty and at worst it causes an inability to satisfy one's own customers profitably. Equally when buyer power is high due to size, lack of differentiation in available products, or over-supply, then prices will be forced down at the same time that a higher quality of product and service is being demanded by customers.

One approach is to make it easier for the buyer, by reducing the cost of buying rather than the price of the product - thereby generating mutual benefit. Value chain analysis is used to explore these ideas more thoroughly, and is described elsewhere in these notes. Equally, there is merit in making it easier for one's own suppliers; the idea that one can gain from being a good customer is not familiar to all businesses, but when supply-side partnerships deliver advantage to both parties, information systems and information management will be part of the story.

Business modelling

In general strategic analysis tools such as the value chain and critical success factors produce a high level picture of key strategic aspects of the business. Before the need for information systems investment can be fully resolved a more detailed analysis of *business processes* and *business information* is needed. This will identify where information originates (whether inside or outside the business) and help to determine who should be responsible for its management and use: in effect, a more detailed business model.

We need a basis upon which to decide about:
* business processes and those who should be involved in them,
* business information and those who should be responsible for it,
* system interdependencies, and
* required changes to organisational responsibilities.

From a more detailed business model a logical plan for systems development can be developed that makes clear the systems projects that will actually acquire, develop and deliver new information systems. The plan should show how each project can be tackled in the most appropriate way within the context of an overall business model that shows where systems are located and how they will interrelate.

A detailed business model allows us to follow through from higher-level analysis. Take for example the value chain, which as a business model in its own right is probably the most useful starting point. External data

requirements and relationships with suppliers and customers can be addressed first, followed by analysis of the linkages within the primary value chain and its primary and secondary activities. Using the value chain the information requirements of each of the main business activities can be analysed within the overall context: primary activities with a view to improving value creation and secondary activities with a view to cost reduction and enabling.

Techniques for business modelling fall into two main categories: process analysis and information analysis. An overview is given here and is illustrated using a retailing business.

Process analysis

The first technique looks at business processes and the detailed way in which information and goods are moved through them; this involves an analysis of inputs, the process steps applied to those inputs, and the resulting outputs.
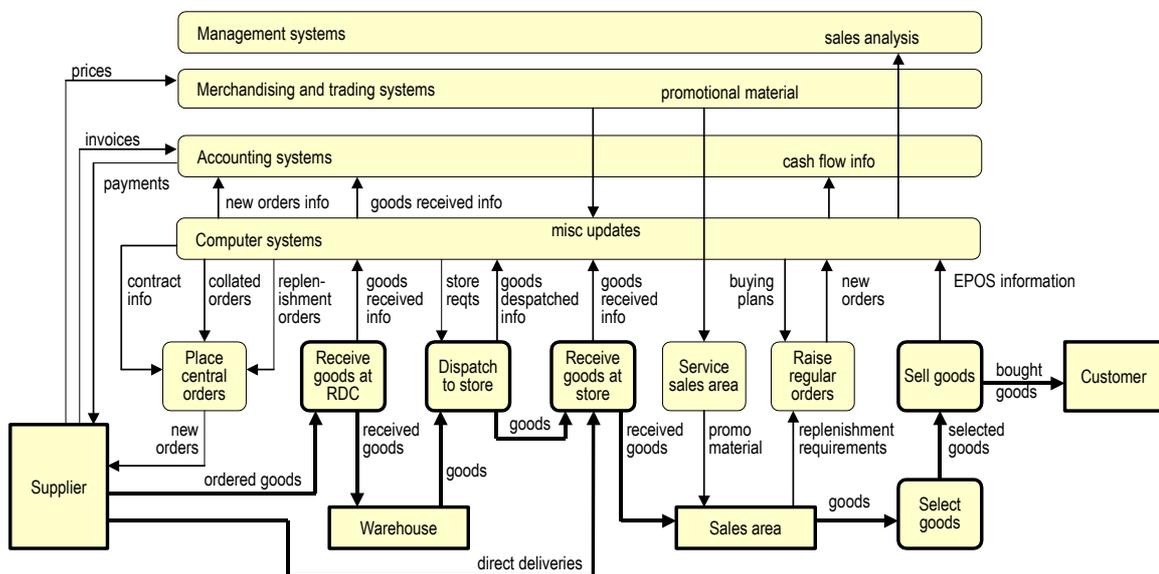
The figure shows a high level view of the activities in a retailing business in the form of a value chain, but this time with clearly identified movements of information and goods between the main activities. Note that in terms of stakeholder-based process analysis described elsewhere, the model here represents the process that serves the needs and expectations of the *customer* – that is what the value chain is intended to do. Other process models might show the activities directed at employees, shareholders, and stakeholders other than the customer.

In the figure the thicker lines indicate the movement of goods, and the thinner lines the movement of information. Inspection of this detail helps us to see (in this example) such things as:

- The different ways in which we deal with direct store deliveries and deliveries to RDCs (warehouses, often referred to as "regional distribution centres").
- The specific movements of information between primary and supporting activities.
- The two different points at which inventory is held: the warehouse and the sales area of the store itself.
- The places where we hold key information, such as contracts with suppliers.
- The lack of any significant activity after the customer sale has taken place.

It is impossible to show all the detail at this high level but it is possible to agree an overall framework within which more detailed models will be used. The consistency between this high-level viewpoint (appropriate to the needs of management) and more detailed models (appropriate to the needs of systems development projects) can always be checked by mapping the one to the other. In this way, the parts of the overall business activity that are to be automated can be clearly positioned and the boundary between systems and clerical activities can be incorporated into the high and low level models.

Information analysis

The value chain has been in use for something like twenty years, and is well know to informed managers. It is interesting that the world has never adopted a similar model that shows a generic model for *information* in a business, in the same way that the value chain shows a generic model for customer-related *process* in a business. However, a second analysis technique has been developed that looks at the way in which information is structured in a typical business.

Information analysis is a more abstract level of analysis that is generally found to be more difficult to understand and internalise than process analysis but it can be used to very good effect. And, where process analysis can take much longer than expected (when the detail of low level commercial activities bogs things down) information analysis can be very rapid. It gets behind processes thinking and finds out what the business is really all *about*, rather than the simpler question of what it *does*; clearly because we are concerned here with information *management* it is important that we take particular care to understand the information that may prevail in a typical business.

This involves an analysis of the *entities* with which the business is concerned. An entity is usually defined as *anything about which we might wish to keep information* and so typical entities are: 'product', 'employee', 'customer' and 'supplier'. These are the things about which we must keep information if the business is to be able to operate effectively.

Research has suggested that, in the general case, there are six areas within which we need information about:

- our marketplace,
- our products or services,
- the related procured inputs,
- corporate resources,
- corporate performance, and
- corporate processes.

MARKETPLACE

Customers and organisations that want to have benefit of the product. Competitors.

deals with

specifies needs of

satisfies the needs of

SUPPORT PROCESSES

The supportive tasks whereby the operation of an enterprise is sustained.

supports

PRODUCT / SERVICE

The material product, service or other deliverable that an enterprise offers to the market.

produces

VALUE ADDING PROCESSES

The tasks whereby a product is conceived, designed, manufactured and maintained.

used in

buys

PROCURED INPUT

The raw materials that are required to manufacture or formulate the product.

specifies

assessed by

PERFORMANCE

The elements of cost, value and time which correspond to the performance of the enterprise.

FINANCIAL   TEMPORAL

assessed by

services

CORPORATE RESOURCE
The internal resource available to service the enterprise's activities.

services

The following paragraphs illustrate the sort of detail that is appropriate to each of these areas.

- **Marketplace:** Information about the marketplace typically includes details of customers, people and organisations that want to have the benefit of the product. Also, about competitors and the way that their presence impacts on success. *Specifically, we might expect to have information about: customers, customer needs, market segmentation, market regions and territories, competitors, suppliers and even economic political and social factors in some cases.*

- **Product:** The material product, service or other 'deliverable' that an enterprise offers to the market; its specification, capability, configuration and operational needs. In the case of service operations, the nature of the service and its speed of response; its information content and the timeliness of the information provided. *Specifically we need product information in terms of: price, discount arrangements, inventory levels, availability, packaging requirements, product specification, product make-up and bill of materials, product documentation, applicability, function and performance specification.*

- **Procured input:** The raw materials and inputs that are required to manufacture or formulate the product or service; their sources and the suppliers offering them. Their characteristics, such as availability, lead time and cost. In the case of service operations, much of the procured input might be external data, taken into the organisation and used to deliver service of some kind to the customer. *Some examples in this area include: procured raw material, components and sub-assemblies, material classification, specification information, sourcing of material and components, compatibility and allowable substitutions, and availability.*

- **Corporate resource:** The available standing corporate resource in terms of people, capital equipment and other assets. Also, buildings and property, but not unused inventory (that is better seen as procured input). *For example: organisational structure, employee information, skills and disciplines, job descriptions, assignment of employees to jobs and tasks, training courses, capital equipment and corporate assets, and allocation of capital equipment to jobs and tasks.*

- **Corporate performance:** This is really management information. Probably information about the financial performance of the business and also information about the temporal performance - how quickly and how productively product and service is delivered. Here we would find the raw input to an executive information system. *Typical management information includes: period results, group profitability, product profitability, corporate performance, average time to ship, volume of production, and general accounting information*

- **Corporate processes:** Information about the tasks whereby the operation of an enterprise is sustained: management, financial, administrative and contractual information; information about how sales people are expected to sell, and the procedures whereby a product (or service) is conceived, designed, engineered, manufactured and maintained. Information about any aspect of operations that is perceived by the customer as useful. *Specifically: sales order processing procedures, purchase ordering procedures, making payments, receiving payments, commercial approval procedures, contract management procedures, cash management procedures, personnel management procedures, corporate management procedures, external commercial procedures, product*

specification, product development, production engineering, quality control, distribution, installation and commissioning.

Information about a business process is not the same thing as the process itself. Consider the financial manual in a typical organisation, for example. It tells the workforce how it is to deal with financial procedures such as claiming expenses and invoicing customers. The content of the financial manual is information about the supporting processes of the business. Equally, an advanced manufacturing planning system includes information about the routeing of work from one point on the factory floor to another, as well as the basic bill of materials.

This idea that we need information about processes is closely connected with quality management, which is often based on process analysis. Anyone who has been through an ISO 9000 quality management assessment will know what this means: documenting and recording every aspect of how the business works.

However, to someone who is stuck in a business where things 'have always been done this way' the idea will be difficult to understand, because the information about business processes is lost in the heads of the people who have been doing the different jobs - no doubt in the same way for years and years. If we are to change the processes within a business, it behoves us to understand and take stock of information about those processes, whether it is written down or simply within the working knowledge of those employed in the business. Until we do this we will never know what we are trying to deal with.

An example

The figure below shows a high-level entity model for the same retailing business for which we saw a process model. It illustrates the way in which the results of this kind of analysis can be presented.

An information model (based on entities, as this one is) shows the key things about which we choose to keep information, and the relationships between them. For example, the figure below shows that there is something known as a 'RESPONSIBLE DEPARTMENT' which is accountable for every 'ITEM' that is sold, through something called 'ACCOUNTABILITY'. This tells us that if we have free access to the information used in the business we could call up (on our computer screen) a list of all 'ITEMS' that are sold; we could then pick one, and ask for its 'ACCOUNTABILITY' which would be a reference to the 'DEPARTMENT' or perhaps the individuals who are responsible; we could then ask for the details of that 'DEPARTMENT' including its 'LOCATION' and what 'CONTRACTS' it has awarded for other 'ITEMS'.

In this way the entity model can be seen as a 'navigation' map that tells the reader how it is possible to move from consideration of one aspect of the business to another. However, when fully developed such a model leads to database designs that ensure that the business will have the detailed data that is needed, and the means to look at it in different ways. The example given
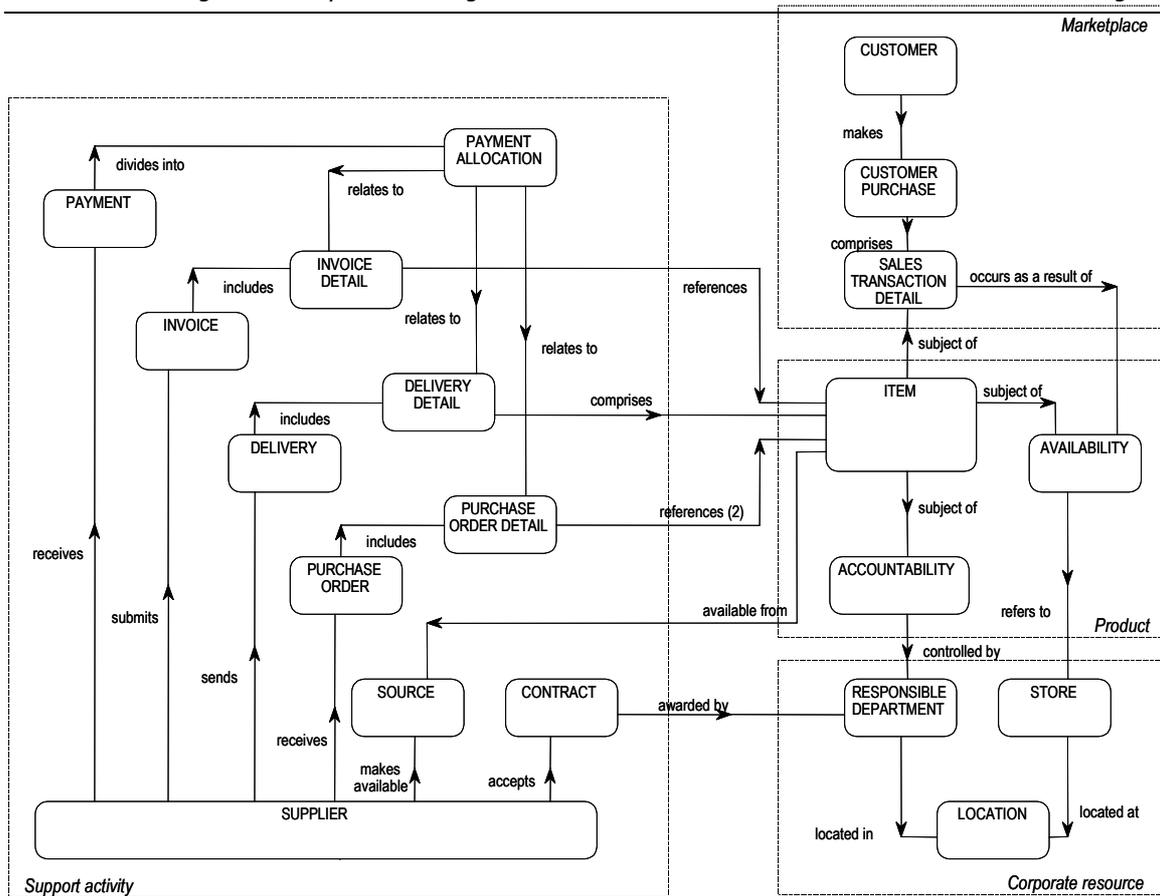
leads to a number of observations about the retailing business, having in mind the six different areas mentioned earlier and the need for data in the business:

- There is no evidence of management information, and therefore it is unlikely that information systems based on this model would provide management with what they need.

- There is a good deal of information about supply activities: letting contracts of supply, placing orders, taking delivery, issuing invoices and receiving payments; these activities are all to do with support and there is no evidence of information about customer-side activities.

- Despite this focus on the supply side, there is no explicit evidence about supplier performance (although it might be 'contained within' the supplier entity, or derived from operational data about orders and deliveries as and when it is needed). We could choose to extend the model to achieve this.

- There is information about retail stores and their location, but nothing about employees and the skills and capabilities that they have. In a business that does not care about the contribution that employees make this is appropriate, but if a business wishes to actively manage employees and use information systems in so doing, then the model needs to be extended to include employees and related entities.

- Most interestingly, the customer is not actually within the scope of the model. This business has no explicit information about customers; it is

only be possible to 'see' them through the individual purchases made. It is not possible to see the sum of all the purchases made by an individual.

The reader may be aware that many retailers have addressed the problem of customer information by providing machine-readable cards that are used to identify customers effortlessly at the time of purchase. These cards can also enable customer account facilities by allowing purchases to be charged upon presentation of the card.

One benefit of information analysis is to find unrealised potential in existing systems and data, in the context of the future business needs. Weaknesses are to be expected but strengths are also sometimes revealed. In one organisation a system deemed to be virtually useless was realised to have new potential uses. The problem was that over time the knowledge of what the system did had decayed, and only one person was still using all of its features. By this person re-training the others and developing better user documentation a major re-development was avoided and benefits were achieved very quickly.

Summary of business modelling

- Information analysis can establish the 'information boundaries' of the business and show how they can be extended, so as to extend the influence of the business with its partners.

- Conceptual models such as the value chain can be augmented with the key processes and information movements, so as to begin understanding the operational aspects of new business ideas.

- Entity modelling can be used to avoid the common fixation on business processes and to seek out new ideas for business development that are not constrained by process thinking.

- When the formal information systems development process begins, outline process and entity models are used as the basis for much more detailed business modelling with operational management and staff.

- From this level, more specific models are developed to specify the detail of business activities and the means to automate them, and the detail of data models that specify the content of databases.

A danger with business modelling is the large volume of information associated with the models when the full detail is addressed. It is important that the modelling is undertaken progressively from *the top down*, otherwise the key requirements will be lost in a mass of impossible detail.

High-level models may have a long life but detailed models need to be maintained regularly. Entity models are particularly enduring and in times of operational change they can offer a stable foundation for employees to hang on to. At a time of radical change in a construction company, the deputy managing director issued a memorandum which basically said: 'This is going to be a very difficult time, but don't ever forget that this business is still about

contracts, projects, plant, subcontractors ....' and so on. A clear statement of the key entities in the business, if ever there was one.

The final comment on information analysis has to be about documentation. In the final analysis, successful information systems will always depend on our ability to do information analysis and to document our ideas without ambiguity and equivocation. Poor documentation of systems has led to enormous unnecessary costs over the last thirty years. Worse, poor structuring and poor documentation of the business's information resource not only produces high costs but also leads to lost future opportunities.

Boston Box

One of the favourite tools of product management is the "Boston Box". This is another of those 2x2 matrices that allows us to explore the differences between current and future potential. The idea of the Boston Box originates from the realm of marketing, where for many years there have been models that highlight the differences between products at the early, middle and late stages of their effective lives. It originated in the Boston Consulting Group, hence the name by which it is known.

Consider the differences between blackboards and whiteboards. At the time that whiteboards were introduced, just imagine the disbelief that would have accompanied the early estimates of the cost of whiteboard pens, compared with chalk. "*It will never catch on*" people would have said – but look at the situation now. Consider the even greater differences between overhead projectors (average cost, $100?) and data projectors (in the region of $1000, for the very cheapest?). Who would have imagined, when the cost was not ten but nearer *one hundred* times greater, that data projectors would be so popular?

What we learn is that there is a lifecycle of product evolution that often starts with high costs and disbelief about practicalities, but migrates to market dominance and huge rewards for the manufacturer and patent holder. Ultimately, products that were once innovative become obsolete but might still have to be maintained (while one customer, somewhere, is still using one).

The world of marketing deals with this using the "Boston Box"[6] (See the figure). The four quadrants are based on two criteria:

- What is the growth potential and potential cash requirement to market the product?
- What is the current market share and how much cash is the product generating?

The four quadrants are then named with terms that have become established in the commonly used business vocabulary:

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[6] Reference can be made to the marketing literature for more information about the way that the Boston Box is used – it goes a long way further than this.

- The **wild cat** is a product that is new, untried, but full of future potential.
- The **rising star** is a product that has been launched, is winning market share successfully but still requires investment to sustain the momentum.
- The **cash cow** is a product that is working well in an established market and is generating cash well.
- The **dog** is a product past its best, that might most usefully be retired.

The "Boston Box"
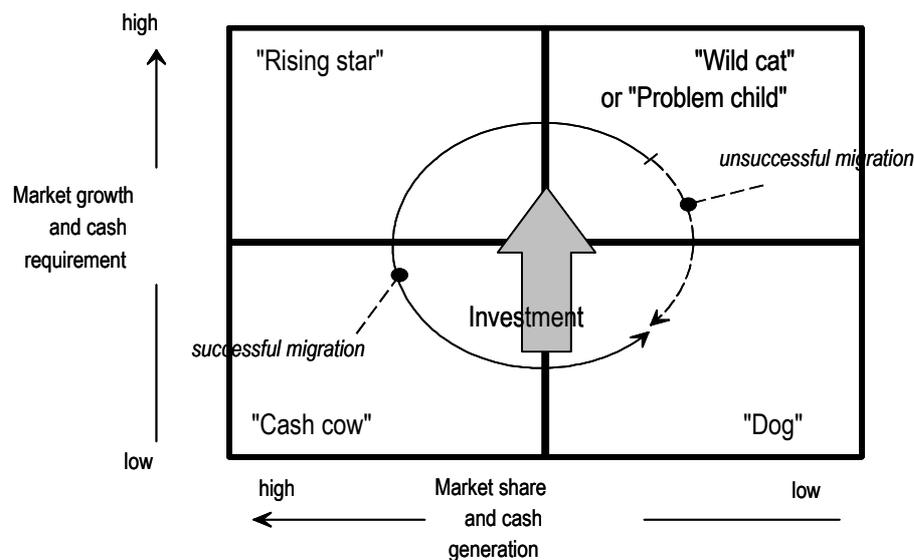
Note in the figure above the two migration paths (the thin circular arrows). Generally products are conceived and introduced in the "wild cat" quadrant. If successful then they migrate around in an anti-clockwise manner until they are retired as dogs. If they do not succeed, there is a very real risk that they default to "dog" status in short order, as shown by the clockwise "unsuccessful migration" in the figure. What is so interesting to us is the significance of this model to the management of information systems. The types of information and systems required in support of products will change during their life cycle and the nature of the required support at each stage will differ.

Consider some of the implications; the types of system and information management needs at the different stages of the product life cycle are quite different:

- **Emergence:** With new or emerging products, demand is very uncertain and the market is ill defined. Customer requirements need to be identified and matched with product attributes and new channels of distribution may have to be developed. The information management focus will be on market research and support for product development.

- **Growth:** In growing markets information needs will change as demand ceases to exceed supply and competitive pressures increase. In the Boston box, the 'stars' will have a quite different look and feel from the others, even from the information management perspective. Stars need major investment to meet the growth in demand, for instance in marketing capability, production capacity, new distribution channels and renegotiated supplier relationships; these areas of concern must all be supported using appropriate information systems. Information about costs and contribution to profit, changing customer preferences, service expectations and competitor activity will become important as the market begins to mature and patterns that were not possible to anticipate begin to stabilise and become understood. Satisfying demand is more critical than beating specific competitors in the beginning – competition comes later. Systems must support growth and must not inhibit the ability to satisfy demand; systems can also create barriers to entry by tying in customers and suppliers, and by making successful entry to the market dependent on the availability of these systems.

- **Maturity:** In mature markets, competitive rivalry will be intense and supply will gradually exceed demand. The primary objective is to retain market share and 'milk' the cash cow: the profits can be reinvested in new areas of product or market development. This implies a more defensive investment strategy and IS can support this by enabling more accurate market segmentation, increasing productivity and optimising working capital requirements (such as inventories) to match anticipated demand. Important considerations are:
  - being more efficient and effective in using resources
  - better management of supply and distribution channels,
  - building up customer switching costs, and
  - an understanding of specific competitors' products, performance, strengths and weaknesses.

  Pricing policies will become more aggressive and critical and these need to be based on good market and cost information. In general, much more detailed control and planning is required. In many companies, while the marketing and other business issues resulting from the product life cycle are well understood, the means to translate them into appropriate, sustainable, information systems is less well appreciated. Many companies try to force-fit existing systems to the high growth areas but they do not work well, because they were designed for mature products. Force-fitting systems from another part of the product portfolio reduces effectiveness and is all too common.

- **Decline:** At the other extreme, in a declining market supply will be greater than demand. The nature of the market and the nature of competition will be well understood and the general business objective will to achieve cost effectiveness, or perhaps to be selective and serve profitable niche areas of the market as the profit margin is squeezed by the actions of competitors

and the maturity of the market. The information required will be very detailed: demand forecasts, profitability analyses (of customers and products), and cost management (both direct and indirect costs). This will be necessary to maintain profitability and to release resources to invest elsewhere in the business.

Managerial issues in strategic management

A proper appreciation of how business and systems strategies can be aligned is still one of the most critical issues of today. For more than 30 years, information systems investments have continued to be risky and have frequently failed to deliver benefits; in the worst cases they deliver distinct *dis*benefits and can even bring a business to its knees. Investment decisions are typically taken without due regard to the benefits that are expected and that can be delivered. The way to ensure that these benefits are properly understood is to know what the business is trying to achieve at the strategic level, and then to serve those needs through appropriate information systems investments that are managed according to the nature of benefit and risk.

The portfolio model is, without question, the most successful single device for engaging management's attention and providing a means for productive discussion about benefits and management style. Taken with the other strategic analysis tools and applied with information systems potential and impacts in mind, the portfolio is really the window through which management debate can move from the world of the business to the world of technology, and back again.

A summary of some of the key management issues concerning strategy is as follows:

- **Strategic alignment**: Ensuring that there is a credible business strategy, and then setting well aligned information systems strategies in place that recognise the dependency of the organisation on information for overall business success and that anticipate future circumstances.

- **Analysis tools**: Choosing and successfully applying appropriate tools for analysing, formulating and refining information system strategies, and ensuring the quality of those strategies.

- **Balance**: Maintaining a balance between the internal and external strategic drivers that bear upon the organisation and determine the actual requirement of strategic management.

- **Ownership and responsibility**: Placing ownership and responsibility for information systems strategies appropriately, and clearly articulating appropriate targets that indicate the success or failure of those strategies.

- **Business units**: Recognising the need for different strategies in individual business units and business functions, and ensuring adequate documentation, dissemination and understanding of strategic plans.

Finally, it is interesting to reflect on the nature of strategy. It is about planning for necessary business change, and therefore one could argue that where there is no need for change there is no need for a strategy. However, in studies it has been found that more than one half of what actually happens *could not have been anticipated* even by the most exhaustive strategic planning process. This is a very telling outcome of recent research and needs to be understood. It means that *flexibility* must be built into strategic planning and that the planning horizon must be set at a sensible distance in time. There is no advantage to planning for the next five years, when most of what happens can not be anticipated.

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