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Information and Communication Technologies Management in Turbulent Business Environments

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Foreword

This is a very timely and relevant book covering information and communications technology (ICT) in a time of high turbulence and uncertainty. It is suitable for a wide range of practitioners, academics, and students and I look forward to using it my graduate level classes as well as recommending widely. The combination of up to date case studies, practical examples, workshops, and sections on future trends and conclusions provides an excellent coverage of material for executives in any size of company. The book is easy to read and it will be just as beneficial for managers & directors as it would be for undergraduate and postgraduate teaching.

The book has an international theme that reflects the wide-ranging nature of the ICT sector. Using the global case studies it is possible to gain significant learning from a wide range of ICT and business situations that confront the 21st. century decision-maker. This book gives an honest appraisal of the advantages and disadvantages of introducing ICT into modern, complex, changing organisations. The successes and failures of implementing ICT are shared with the reader in equal measure to ensure the right decisions are made for the good of your organisation. Current and prospective managers, from all sizes of firm, can use the practical material to ensure they gain the greatest benefit from their investment in ICT. (it is even more relevant as organisations around the world are trying to cut costs at the same time as using ICT to compete fiercely with their rivals).

To underpin understanding of what, in normal circumstances, might be viewed as a complex area, the book also provides a coherent flow of material to aid the management of a company's crucial ICT resource and thus unravels and sheds light on the critical *people, culture and technology dynamics* that are essential to craft ICT-based business and technology strategy. Specifically, the first part of the book identifies the importance of having a robust strategy in place before embarking on the implementation of ICT; once this strategy is in place the second part shows the range of tools, techniques, methods, and methodologies that are available to implement your plan; and the third part of the book identifies the challenges that confront modern organisations as they strive to utilise ICT as a strategic weapon at a time of major change.

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***Elias G. Carayannis** is full professor of science, technology, innovation and entrepreneurship as well as co-founder and co-director of the Global and Entrepreneurial Finance Research Institute (GEFRI) and director of research on Science, Technology, Innovation and Entrepreneurship, European Union Research Center, (EURC) at the School of Business of the George Washington University in Washington, DC. Dr. Carayannis' teaching and research activities focus on the areas of strategic government-universtiy-industry R&D partnerships, technology roadmapping, technology transfer and commercialization, international science and technology policy, technological entrepreneurship and regional economic development.*

Preface

The massive changes that have occurred in the business world over the last 12 months show how difficult it is to plan for the future. It is extremely important that organizations are able to counter the turbulence in the business environment. There have been many changes in information and communications technology (ICT) over the last 40 years. However, we may look back on this era as being rather static in terms of what happens in the next 10 years. As recently as 25 years ago very few small and medium-sized enterprises (SMEs) employed computers for their data processing requirements. Even today SMEs cannot afford to employ many computing professionals. However, they do rely on ICT to provide their businesses with that extra edge in a very competitive market place. Affordable computer software and hardware have added millions of organisations to those that rely on ICT. However, the vast majority of computer textbooks that have been written over the last 40 years have focused on large organisations that are in a position to either develop their own systems or purchase off-the-shelf software.

For many years individual departments had software developed especially for their particular requirements. This worked for the various functional areas, such as personnel, accounting & finance, and sales. Certain systems such as sales order processing would cross these functional boundaries. Those organisations that took advantage of integrated systems were able to see the benefits of efficient and effective computing. It is interesting to note that even in today's business environment, enterprise-wide systems are being sold worldwide in considerable numbers.

Increasingly, companies are looking outside their organisational boundaries to take advantage of ICT. Through the use of the Internet, extranets, and strategic alliances they are improving their business processes and translating this to bottom line profit. Firms are reaping benefits from having similar software to their customers or suppliers. This can enhance longer-term contracts and relationships even at times of increased competition.

Gaining business benefits from investment in ICT is far from guaranteed. There are too many examples of expensive information systems that have been developed with all good intentions – failing to realise expected benefits.

This book, entitled *Information and Communication Technology (ICT) Management in Turbulent Business Environments* aims to inform today's business managers the important ICT strategy in changing business environments, techniques for effective ICT development, and ICT challenges for the future. This is not a technical book. It provides a basis for senior managers who are responsible for ICT development for enterprises with some guidelines on ICT management under changing business environment. The authors prepare this book from the basis of over 25 years of experience on ICT research, development and management.

This book is divided into 3 sections: Section I focuses on ICT strategy in changing business environments; Section II focuses on technologies for effective ICT development; and Section III focuses on ICT challenges for the future. Section I of this book concentrates on putting in place a strategy that can deliver benefits for your organisation. The book concentrates on providing practical examples of how to build up the expertise and knowledge to undertake these activities on your own. The first two sections of the book are a combination of workshops and case studies. As already mentioned the vast majority of firms worldwide can afford software and hardware but not ICT professionals. Just reviewing the current developments that are facing senior managers in the 21st century global business environment will show how ICT is necessary to keep up with the pace of change.

Most of the issues covered at the beginning of Chapter I will be revisited later on in the book. A major point to remember is that when your firm introduces change through ICT there are likely to be several other change initiatives taking place in your organisation at the same time. Each of these initiatives will be competing for scarce resources. These resources may be finite and that is why it is important not to undertake an ICT journey that does not deliver for the organisation. Can e-business and e-commerce transform your organisation? Are you realising the potential benefits of integrated supply chain management? Can activity based costing provide your organisation with a consistent way of increasing profits? Does your organisation use ICT to take advantage of the vast amount of business intelligence available in the environment?

The increased information flow between organisations enables firms to set up temporary arrangements to take advantage of synergies from ICT. Through improved interrogation facilities, organisations are able to analyse data from the environment more effectively (there is still an extra training requirement). Many more organisations are viewing ICT as a strategic weapon rather than an operational tool. The use of ICT should reflect the dynamic business environment rather than being seen as a millstone around the neck of modern-day decision-makers. It has certainly changed the way that many companies view 'working'. Home-working has become feasible through the improved connectedness between work and home.

The geographical positioning of your staff is no longer a fundamental concern as ICT can shrink both time and distance. In the future, information and intelligence will be viewed more as commodities. One element of the modern organisation will be the way that senior managers are more aware of the potential of ICT. However, that may necessitate a considerable education and training initiative for many firms. A significant number of organisations may feel that ICT is not one of their core capabilities and they may decide to outsource this facility.

Chapter II focuses on the need to view the provision of effective information and intelligence as key drivers for on-going success. Over the last 40 years, many different types of information systems have been viewed as capable of providing organisations with a competitive advantage in the market place: transaction-processing systems, management information systems, decision-support systems, executive information systems, expert systems, strategic information systems, knowledge management systems, and enterprise-wide systems. However, the future may require a fusion of the Internet, extranets, ERP II, and business intelligence systems to provide organisations with the ability to move their business forward.

It would be futile for any organisation to develop information systems or utilise ICT without using it to underpin their current and future business strategies. It is extremely important that these areas are closely aligned. Similarly, it may be necessary to closely align these two areas with the firm's training and education strategy. Through the use of workshops and case studies, the reader will be guided through various activities to try and engage their staff in this process. It will always be important to involve staff with these particular initiatives. The business planning process should not be static or a one-off exercise. The business plan should be continually revisited. In the final analysis, there are no ICT projects – only business projects.

It will be a useful experience to have staff from different functional areas working alongside each other trying to identify business opportunities through the use of ICT. It is very important to prioritise your development of your information systems as tying up strategic staff for several years could be costly to the firm. In the meantime, your competitors could be developing key strategic systems. Chapter III gives guidance in this area. If an organisation decides to develop an enterprise-wide system it will by its very nature involve the vast majority of staff. It will be a major change project and the firm will have to plan for this change.

All companies have a series of business processes in place to allow them to undertake their day-to-day activities. In many instances, these processes have evolved over a number of years. It is highly likely that when new information systems are introduced these business processes will change. Chapter IV follows on neatly from Chapter III in that it isolates the key issues that may confront an organisation when it decides to put in place an ICT strategy. Again, through the use of workshops different departments will identify how they interface with other functional areas in the firm.

Chapter V discusses the how organisations should manage and plan ICT change. This is a very important aspect and responsibility of managers because setting realistic expectations and goals are crucial at this stage to avoid disappointment in performance after introducing ICT. Chapter V goes on to show how ICT can improve business relationships between firms. If two firms, one a customer and the other a supplier, purchase the same software, it could result in a win win situation. The customer is happy because he or she may have access to the supplier's systems so as to be sure of supplies, raw materials or parts. The supplier is content because the customer is more likely to do business with them and possibly negotiate a longer-term contract. SMEs can also gain from combining with other SMEs to provide a full range of services to larger organisations. This can be cemented by the use of ICT.

It would be inappropriate for any organisation to introduce new information systems without ensuring that its employees are prepared for what could turn out to be such a significant change. Recently, ICT managers have put change management at the top of the list of current concerns. Once again, this chapter relies on workshops to communicate important issues that must be addressed by most organisations. Chapter VI identifies resistance to change as a key issue that must be tackled in advance of introducing new ICT. The way that your organisation introduces ICT may decide whether the implementation is successful or not. To show the importance of this area, several workshops are included to reinforce the message regarding the management of change. In some situations, ICT staff may have to act as ambassadors for the new system – walking and talking any proposed changes.

The successful organisations of the 21st century are likely to be those who know when, and when not, to introduce ICT. There may be penalties for being the *first mover* – being the first organisation in your area to introduce a new piece of software. However, would you be able to hold your nerve while your competitors started developing or purchasing new systems? The development of an effective customer relationship management system (CRM) may be critical to the business success of your organisation. It is becoming more prevalent that the critical systems are those that glean intelligence from the environment. Business intelligence systems system is the fastest growing ICT sector. It is crucial that we are able to evaluate the potential business benefits of any future investments in ICT.

Chapter VII reveals how there are a range of tools, techniques, methods and methodologies that can be adopted to improve ICT development. The systems development life cycle (SDLC) is covered in detail in Chapter VIII. However, the majority of organisations will not have the ICT resources to undergo this process. They will be more likely to use certain techniques that they will find useful in certain circumstances. For instance, through the use of information requirements analysis (IRA) they will be able to identify data and information gaps within their organisations.

Through process mapping, they will have the potential to analyse and, hopefully, improve their business processes. For over a decade, organisations have been aware of the potential business process re-engineering. This is especially useful for companies that need to make radical changes to their existing working practices. They may decide to focus their energies on their critical, business-winning activities.

The development of information systems is a complex process and there are many opportunities for things to go wrong. System developments are usually time-consuming, costly and they involve many different stakeholders. It is for this reason that they need to be carefully project managed. Using system development and project management methodologies will not guarantee the success of a particular ICT initiative. However, there has been a general consensus in the industry for several decades that it is worth trying to control and coordinate the process.

Chapter VIII takes an even-handed perspective regarding these issues. The traditional SDLC is also viewed as being inflexible and 'hard,' so it is important that alternatives are explored. A comparison will be made between hard and soft system approaches. Normally, in large ICT projects, the SDLC is aligned with formal project management methodologies (i.e. Prince 2). These methodologies generally provide a series of steps to follow for the completion of a project. Once again, this chapter will look at a number of different approaches. Case study material will be used to isolate some of the key problems that may arise during a system development.

Chapter IX will view some of the key issues that can confront firms when they are preparing an ICT initiative. Through the use of workshops, a number of areas will be addressed. Does your organisation have flexible information systems? Do your existing systems provide accurate information and intelligence? Do your employees need to deal with data overload? Is the output from your ICT in the right format for managers to make effective decisions? How do you capture information and intelligence from your business environment? What techniques are your competitors using to capture information? In the final analysis, your organisation may decide to purchase a company-wide ICT package. This may be a radical decision – but it may be the correct one for your organisation at this particular point in time.

One of the most difficult decisions during any ICT initiative is when to go live with a new system. If you make a wrong decision, it could have serious consequences for your organisation. It is necessary to synchronise several problematic areas, i.e. training of staff. Has the proposed system been tested sufficiently in the right conditions? Chapter X addresses a number of these important issues using a series of relevant case studies. Does your organisation have the resources to run your old system alongside the new one for several weeks? This may put enormous pressure on your employees, but it may be a safe option for your organisation. Would it be better to introduce a new system one department at a time? This may appear to be a good option. However, there is every possibility that this department receives and sends out data to other areas of the organisation. It may be difficult to reconcile this approach in a company that interfaces directly with its customers. Another approach that has gained in popularity is the direct changeover or 'big-bang' approach. This approach is analysed in Chapter X through the use of case studies. This normally means ending the use of your old system on the Friday afternoon and starting with the new system on the Monday morning. As you can imagine, this requires precise risk management. What happens if things go wrong? Does your firm have a recovery position – a plan B? Can you revert back to using your old system? These are important questions and they need to be considered well in advance of any implementation.

We have already identified that the introduction of ICT can be a time-consuming, costly, and risky undertaking. However, organisations are increasingly reliant on ICT for their business survival. It is inevitable that some ICT projects will encounter difficulties. However, it is possible to learn from the experiences of organisations who have been through these processes. In Chapter XI, it is argued that it is more likely that you will read about systems experiences in the public sector than the private sector. However, there is an increasing set of case studies from the latter sector that reveal various causes of concern from ICT projects. The chapter begins by identifying a number of issues that can lead to problems within ICT projects. A number of case studies are introduced to try and shed light on another complex area. The chapter ends by providing some useful advice on how to plan for ICT developments.

Chapter XII discusses the drivers and barriers for ICT development, specifically presenting them with respect to specific industries. This will be very useful for managers in the respective industry to identify the constraints they could be facing in introducing ICT, and also the reasons other similar industries adopt ICT. Chapter XIII reviews the current developments and diffusionXIV critically discusses the e-technology for today's businesses. It provides a detailed account of e-business, B2B and B2C cases. Chapter XV discusses the knowledge management aspects of ICT. This includes classifications of knowledge types and how they could be useful in introducing ICT. Chapter XVI gives a summarised account of the issues concerning with security and risk in using ICT. This chapter provides various methods to mitigate and manage risk.

In addition to the aforementioned material, you will have direct access to six global case studies relevant to this area. They cover a range of different critical issues that will concern small, medium and large organizations. They illustrate the global nature of information and communication technology at a time of major change.

To conclude, this book provides a managerial perspective of the introduction of ICT in turbulent business environments. It is a basis reading for managers who are involved in ICT development and introduction in organisations. Many lessons, cases and critical issues illustrated in the book will give the readers a collective and holistic view on this respect.

Acknowledgment

This book, entitled *Information and Communication Technology Management in Turbulent Business Environments* aims to inform today's business managers the important ICT strategy in changing business environments, techniques for effective ICT development, and ICT challenges for the future. This is not a technical book. It provides a basis for senior managers who are responsible for ICT development for enterprises with some guidelines on ICT management under changing business environment. The authors prepared this book from the basis of over 25 years of experience on ICT research, development and management. The authors would like to thank the referees for the constructive comments that have led to major improvement in the manuscript. We also would like to thank all managers who participated in our previous projects which have led to major contributions in this book. Last but not least, we would like to thank the staff at IGI Global who have been very helpful and supportive over the duration of this book project. We hope this book will be a joy to read and a source of inspiration in the process of introducing ICT in any turbulent business environment.

Section I
ICT Strategy in Changing Business Environments

Chapter I
Review of Current ICT Developments

Increase in business volatility and competitive pressures have led to organizations throughout the world facing unprecedented challenges to remain competitive and striving to achieve a position of competitive advantage (Maguire and Suluo, 2007)

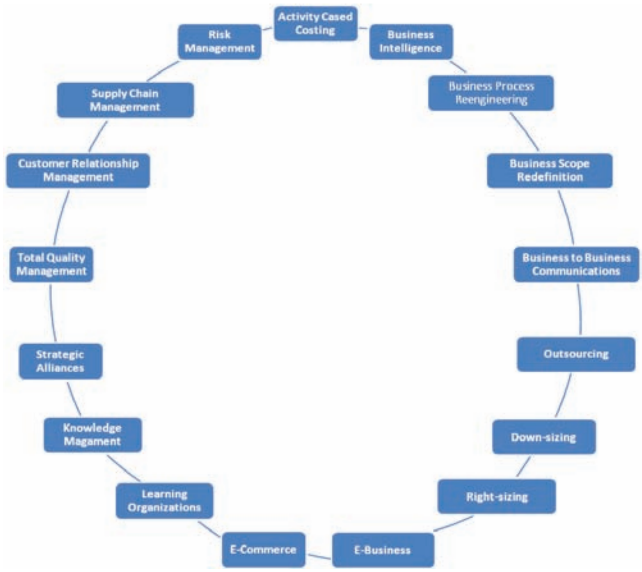
Research by the analyst firm, Gartner, found that I.T. directors considered business intelligence to be their number one technology priority for the second year running. In particular, consolidation of business intelligence tools will be a major focus (Gartner February, 2007, www.gartner.com/2_events/conferences/bie8i.jsp)

INTRODUCTION

The issues that are currently affecting all managers are similar to those facing managers of **ICT**. The following is a list, though not exhaustive, of the issues confronting organizations in changing business environments as shown in Figure 1.1.

Most organizations are conducting their business in global situations that place extra pressure on their effective usage of ICT. They may have to think in terms of worldwide purchasing of parts and raw materials. Many organizations view their

Figure 1.1. ICT related issues



products as being global. Firms will have to ensure that they can provide efficient supply chain management. This may require an integrated customer service where geographical boundaries should not cause loss of business effectiveness. Companies may need to provide rationalised manufacturing as they roll-out products worldwide. All organizations will strive to gain global economies of scale.

However, as one can imagine developing an ICT strategy that is able to stand the test of time is well nigh impossible. In 2008 large firms in the ICT sector, such as Google, I.B.M., H.P. and Sun are rolling out major *green* initiatives to reflect current environmental concerns. It is not too long ago that the ICT sector was monopolised by the United States and the United Kingdom. Increasingly sector pundits are talking of the *Chindia* phenomenon. ICT research and development spending in China is still behind the U.S. but ahead of Japan. Firms in India, such as Infosys, are increasingly moving into the high value-added part of the sector.

The ICT sector has taken nearly 50 years to achieve an optimum level of service with internal systems. It is now trying to optimise ICT that extracts information and intelligence from the environment and other organizations. This is a different ball game and it may require firms to put in place a radical recruitment programme or at the very least a retraining programme to ensure they have the correct 'in-house' competences.

Information and Communication Technology has become more important to firms in recent years because:

Exhibit 1.1.

Mini Case: Efficiency and Effectiveness

Rentokil Initial's use of wireless systems to cut the time taken to process sales from 20 to five days has demonstrated the business benefits that can be delivered by mobile technology. The hygiene services company has given its U.K. salespeople mobile access to its Oracle resource planning system which could lead to a global roll-out. The project allows Rentokil's salespeople to access more product information when visiting customers and create additional sales and service opportunities. Customers also receive their goods earlier, thanks to faster order processing.

Most organizations are conducting their business in global situations that place extra pressure on their effective usage of ICT. They may have to think in terms of worldwide purchasing of parts and raw materials. Many organizations view their products as being global. Firms will have to ensure that they can provide efficient supply chain management. This may require an integrated customer service where geographical boundaries should not cause loss of business effectiveness. Companies may need to provide rationalised manufacturing as they roll-out products worldwide. All organizations will strive to gain global economies of scale.

Exhibit 1.2.

Mini Case: Information Transparency

When Ford Motor Company introduces a new part or product it can send e-mails to tens of thousands of staff. These e-mails can include attachments that provide employees with detailed analyses of the change. They can include designs of the new part/product as well as fitting arrangements. Training can be provided on-line. Staff can feedback comments to Head Office if they have any queries about the product. This is an efficient and effective way of rolling out new products. It does away with the need to undertake a global training programme with expensive travelling and hotel bills.

- HISTORICALLY INFORMATION HAS BECOME MORE EASILY ACCESSIBLE WITH IMPROVED INTEGRATION FACILITIES. Intranets have resulted in a less complicated process to manage, update, distribute, and access corporate information. The United States' largest manufacturer of steel products, U.S. Steel, has developed a sophisticated intranet solution to provide employees access to up-to-date personal benefits information, allowing them to make more informed decisions related to health and financial benefits provided by the firm (Jessup & Valacich, 2006). Intranets can also allow employees access to staff phone directories, staff procedures or quality manuals, information on product specifications, product lists, discounted prices, competitor information, factory schedules, staff bulletins or newsletters and training courses (Bocij et al. 2006). Doing business on the internet is now a focal point for the business potential of many organizations (Boddy et al. 2002).

- MORE ORGANIZATIONS ARE HOLDING COMPUTERISED RECORDS. It is now possible for an individual to successfully use a database to make a good living. The real cost of hardware and software has decreased dramatically over the last twenty-five years. The onset of user-friendly software has meant that firms do not need to employ skilled information systems staff to gain from ICT. Small and medium-sized enterprises (SMEs) can purchase hardware and software to gain a competitive advantage in the market-place. They may be able to develop a niche area that is underpinned by the use of specialised ICT.

- THERE IS AN INCREASING USE OF PUBLIC (GOVERNMENT) NETWORKS. It is intended that the National Programme for Information Technology in the United Kingdom will give patients greater involvement in decisions about their own care, and over time access to, and ownership of their own records. Within 10 years it is expected that 30,000 General Practitioners (doctors) in England will be connected to almost 300 hospitals (Maguire, 2007). It is hoped that information will move more quickly around the NHS with health care records, appointment details, prescription information, and up-to-date research into illnesses and treatment accessible to patients and health professionals whenever necessary (Jones, 2004). It underpins Information for Health (1998-2005) by having the goal of trying to ensure that those who give and receive care have the right information at the right time.

- ORGANIZATIONS ARE WORKING IN INCREASINGLY COMPETITIVE AND FLEXIBLE ENVIRONMENTS. No business or organization can remain in ignorance of, or unresponsive to, what is going on its environment and hope to remain successful for very long (Cooke & Slack, 1991). Even though a significant amount of decision-making takes place across the boundaries of the organization concern with the environment within which companies operate is a relatively new phenomenon. Without understanding this environment it is very difficult to be effective at gleaning business intelligence. To be effective at extracting intelligence from the business environment it may be necessary for a group of staff to have a well-defined set of key competencies. An ability for visioning may be very important; expertise in strategic planning may be useful but this may be dependent on the amount of turbulence in the environment; there will certainly be a requirement for flexibility – a need to be proactive; being skilled in managing change may be crucial as business plans may require change on a regular basis; environmental scanning will be required as this process takes place as part of an open system. It is proposed that the role of *intelligence analyst* will become more and more important to organizations. It is not within the scope of this paper to cover this range of competencies. However, an attempt will be made to give an overview of previous work undertaken in the area of environmental scanning (Maguire & Robson, 2005). Organizations require adaptability, flexibility and the ability to create variety in order to survive in changing, complex environments. In contrast to this flexibility, the organization may require a technology for maintaining some consistency and intelligent behaviour (Cooper, Hayes, & Wolf, 1981). In a general sense organizations need to be in balance with their environments. This can often take time that the firm doesn't have. Once an organization has gone out of balance, getting it back again is inevitably a very difficult and sensitive process. In an ideal world, adaptation to the environment would be a gradual incremental process in which the dynamic balance of the organization was not put at risk. In practice, however, competitive environments can change very quickly, and companies very often do not change with them (Hendry, 1995). For an organization to be successful it must have a clear vision that focuses its investments in resources such as information systems and technologies to help achieve competitive advantage. These may include: having the best-made product on the market, delivering superior customer service, achieving lower costs than rivals, having a proprietary manufacturing technology, having shorter lead times in developing and testing new products, having a well-known brand name and reputation, & giving customers more value for their money. In theory, organizations can gain, or sustain, each of these sources of competitive advantage by effectively using information systems (Jessup & Valacich, 2006). The openness of the information and communications technology has changed the internal culture of many of these firms. It has made them susceptible to increased scrutiny by customers. They will need to be at least more reactive, if not proactive, in their quest to provide better services to current and prospective customers. As one would expect both internal and external communications have been speeded up by the increased use of ICT, however, this has also increased the pressure on the internal resources of the organizations. It has also focused on the need to provide accurate information**...**The very nature of the use of this ICT has led to an increased of demand for the products and services of these small firms. This has also led to increased workloads**..**Where there is a lack of consensus is in relation to the burden of administrative processes and paperwork. A number of firms state that ICT has led to an increase in workload and others say it has been reduced. Overall, it appears that ICT has led to an increase in the workloads of existing staff. This may lead in the longer term to issues surrounding occupational health. It is now possible to gain increased access to staff at home and in the field which may lead to an increase in virtual working in the near future.

- THROUGH THE USE OF ICT ORGANIZATIONS SHOULD SEE MORE OPPORTUNITIES TO DEVELOP STRATEGIC INFORMATION SYSTEMS. Most organizations rely on a comparatively small group of systems called strategic information systems. These strategic systems usually increase the organization's real and perceived value to potential customers by providing information and services with products, customizing products, eliminating delays, improving reliability, making products easier to use, bypassing intermediaries, or reducing transaction time (Alter, 2002). Generally speaking they may provide the customer with a seamless service and added-value in terms of customer care. Strategic information systems should have a significant impact on an organization's financial performance. These systems may help an organization enter a new market, gain or maintain market share or better serve customers (Jessup & Valacich, 2006). When the SABRE system was developed by American Airlines in the 1960's it was probably not initially viewed as a strategic information system. However, this system was able to serve possibly billions of customers over five decades. The sophistication of the early system meant that it was difficult for their rivals to replicate this strategic system. There would also be very significant entry costs for any rival organizations. American Airlines were able to reinvest increased profits back into the system to maintain its integrity. When McKesson's Drug Company started putting terminals in Drug Stores to help staff with reordering problems it was highly unlikely they referred to the change as the development of a strategic information system. However, the tighter coupling of customers and suppliers provided McKesson's with increased profits over a number of years. They had identified an operational problem encountered by their customers and they were able to provide a solution that had far-reaching strategic consequences for their organization.

- HORIZONTAL & VERTICAL WORK PATTERNS WILL BE CREATED AS NEEDED. Creating the 21st century organization will not accomplished by using 20th century information and communications technology. This is especially true if it has been specifically developed for functional areas, i.e. marketing or human resource management. These systems may not let different departments communicate with each other. This will have an effect on horizontal and vertical flows of data, information and intelligence. Important sales, production and stock control data may have to be entered manually into several separate systems (Turban et al 2004). The 21st century enterprise will reorganize its key business processes to take advantage of business intelligence that may be accessible from the firm's business environment.

- ICT WILL CONTINUE TO SHRINK TIME AND VIRTUAL DISTANCE. Effective and efficient use of ICT will continue to reduce time and virtual distance between suppliers and customers. With the ability to automatically generate purchase and work orders, and release them on-line, this will help reducing lead-time and hence improving the efficiency in business processes. The traditional method, e.g. faxing purchase order and so on could be eliminated, hence reducing virtual distance. With the new strategy of Vendor Managed Inventory (VMI), it is the responsibility of the supplier to replenish items for the customers. Hence, releasing purchase order will be a thing of the past. Vendor will assess the ICT system used by the customer and establish a reorder point to automatically trigger order and delivery. This could significantly reduce lead-time and virtual distance. P&G and ASDA-Wal-Mart are using this approach to ensure items are never out of stock on the shelves. The traditional supply chain has been concerned with a liner flow of information and products or services between suppliers and customers through various stages of processes. In the 21st century e-economy, the Internet enables e-supply chain, which has extended the linear flow of supply chain to an eco system of supply web (Basu, 2001). New concepts are emerging as externally focussed and adaptive for competing in the collaborative economy of suppliers, producers, distributors and customers, e.g. e-sourcing, e-logistics, etc. Indeed, these e-concepts aim to create an increasingly seamless e-supply chain, with the support of various e-technologies for logistical operations and management, e.g. Radio Frequency Identification (RFID), smart card, Electronic Data Interchange (EDI), etc., and also network technologies, e.g. Internet, Intranet and Extranet. In such e-supply chain, information will be accessible and transferable, and it is usually supported by some kind of back-office applications (e.g. Enterprise Resource Planning (ERP) systems), and the process of order and delivery of physical goods and services will be streamlined.

- ICT WILL TRANSFORM LINKS BETWEEN CUSTOMERS AND SUPPLIERS AND TO CREATE INCREASED INFORMATION FLOWS BETWEEN ORGANIZATIONS. Extranets allow organizations to communicate and share data with several organizations. The extranet allows employees to place orders, access data, check the status of raw materials and products, and send e-mail (Turban et al. 2004). This creates higher network communication traffic, which in turn transforms the links between customer and suppliers. With an easier procurement and ordering processes, more up to date information is used in the process hence reducing the chances of errors, delays, over stock or under stock. However, it is important for an organization to recognise that "personal touch" in the supplier-customer relationship is still required. Hence, joint development programme, supplier-customer relationships building away day, and so on are still critical in ensuring a long term partnership and relationship building. In the turbulent business environment, the intense competition would also mean that secure supplies and markets could not be guaranteed. Therefore, organizations must adopt a more long term and sustainable relationship building method to cope with the advancement of ICT technology on improving efficiency in the supply chain.

- ICT WILL BECOME MORE RESPONSIVE AS SOFTWARE BECOMES MORE FLEXIBLE. It could be argued that the only way an organization can develop information systems that remain effective in turbulent environments is to make them as flexible as possible. However, when specifications are agreed between purchaser (Management, users, etc.) and supplier (I.S. staff, outside consultants, etc.) and the system is not scheduled to go live for several years it is very difficult to change these agreements without financial penalties being imposed (Maguire, 2004). The advent of information technology, expeditious data processing ability, configurable platforms, networking, the internet and web-enabled systems has facilitated the rapid growth of the use of e-business in both public and private sectors enterprises. In the UK, supply chain management (SCM), enterprise resource planning (ERP) and customer relationship management (CRM) are individually the leading e-business applications used by many large-scale enterprises. The use of ICT has grown and changed with increasing rapidity. Its adoption can be related to not only multinational corporations but also SMEs. ICT is seen as being critically important to the financial well being of all organizations. In theory SMEs are able to use ICT to operate successfully in the global market place (Maguire et al. 2007). Current software is flexible enough to be tailored by SMEs for their own particular requirements.

- ORGANIZATIONS WILL DIFFERENTIATE MORE BETWEEN DATA, INFORMATION, & INTELLIGENCE, AS THESE COMMODOTIES BECOME EVEN MORE IMPORTANT IN THE FUTURE. In a recent study, the Economist Intelligence Unit (EIU, 2005) conducted an online survey of 122 senior executives in Western Europe, 68 of who were based in the UK. Two-thirds of the companies in the survey complained that while their IT systems generated huge volumes of data, executives could not act on much of it. Too much information could be impeding decision-making. Over half of the executives said that IT's failure to prioritise information was the main barrier to effective decision-making. This is one significant finding as far as this study is concerned. Simply providing access to an ocean of information, assisted by IT, is not enough. Executives need knowledge delivered in a form they can quickly interpret and act on (EIU, 2005). The term business intelligence, also known as BI, is a multi-faceted concept defined and described differently by various scholars. Vitt el al. (2002) describe BI based on three different perspectives; making better decisions faster, converting data into information, and using a rational approach to management. They identified that in the past decade, many authors have treated BI primarily as a technical topic, without paying much attention to the business-winning potential of enhanced BI, such as securing competitive advantage, improving operational efficiency and maximizing profit. BI, in theory, is the opportunity to bring together information, people, and technology to successfully manage an organization (Maguire & Suluo, 2007). However, according to some writers (Vitt et al., 2002), more and more organizations are realising that becoming increasingly 'rich' in data does not necessarily result in a better understanding of their business and markets or even provide improvements in operational performance. It is argued that the most successful companies are those that can respond quickly and flexibly to market changes and opportunities with an effective and efficient use of data and information (Turban et al., 2004). Accordingly, quality, flexibility and responsiveness are strategic issues for organizations to assimilate; otherwise more flexible organizations may take over their position by offering better perceived value (Wilson, 1994). If we accept that intelligence refers to information gathering and analysis, ICT may be able to assist an organization in future decision-making.

- INFORMATION STRATEGIES WILL BECOME MORE CRUCIAL TO ORGANIZATIONS & MANAGERS NEED TO BE EDUCATED IN THE POSSIBILITIES OF ICT. It is very important that organization put in place information and information systems strategy. It is also crucial that they underpin these strategies with a coherent I.C.T. platform that will give the firm some flexibility as it attempts to develop a portfolio of effective systems. The ICT strategy generally determines the technological infrastructure of the firm to ensure the most appropriate technologies and best standards are used in terms of cost, efficiency, and effectiveness. This should always be done with a view to future ICT requirements. The I.S. strategy basically determines how ICT is applied within an organization. Organizations must ensure that these information systems fully support the business requirements of the firm (Bocij et al. 2006). For many authors in this area the strategic alignment of the business effort and the ICT effort is the cornerstone of valid information systems planning (Alter, 2002). It is very important that senior managers get involved in assessing and selecting potential information systems projects. They should be in a good position to identify those information systems that will deliver significant organizational benefits for the company (Jessup & Valacich, 2006).

- ORGANIZATIONS WILL CONSIST OF SELF-MANAGING INDIVIDUALS ENGAGING IN PRODUCING INFORMATION & INTELLIGENCE ON A *REAL-TIME* BASIS. Intelligence is an essential asset for organizations, whether it is human or artificial. However, human intelligence is still viewed as the most important and sophisticated form of intelligence in the environment (Elliott, 2004). It may be the scanning activity that is the most important element. The decision-maker is on the lookout for information and knowledge and this might be continuous or periodic in nature (Marakas, 2003). It may be that internal information that helps managers review and improve the performance of an organization can be viewed as business intelligence (Chaffey & Wood, 2005). External information can support the process by monitoring trends in relation to market share and competitor activity. It may be possible to use the information to develop a vision and strategy for the organization. Recently more has been written about intelligent agents – autonomous, goal-directed computerised processes that can be launched into a computer system or network to perform background work while other foreground processes are continuing (Alter, 2002). An e-mail agent can interrupt an employee when necessary to deliver important information; a data-mining agent can sort and filter data in a database to identify trends; and a news agent can compile relevant, personalised news bulletins for individuals. To be effective at extracting intelligence from the business environment it may be necessary for a group of staff to have a well-defined set of key competencies. An ability for visioning may be very important; expertise in strategic planning may be useful but this may be dependent on the amount of turbulence in the environment; there will certainly be a requirement for flexibility – a need to be proactive; being skilled in managing change may be crucial as business plans may require change on a regular basis; environmental scanning will be required as this process takes place as part of an open system. It is proposed that the role of *intelligence analyst* will become more and more important to organizations. It is not within the scope of this paper to cover this range of competencies. However, an attempt will be made to give an overview of previous work undertaken in the area of environmental scanning. Managers who make complex, long-term decisions need systems that can augment their intelligence and expertise. Three of these intelligence support systems (ISS) are, decision support systems, executive information systems, and artificial intelligence & expert systems (Gupta, 2000).

- THE WAY THIS IS DONE WILL DIFFERENTIATE ONE ORGANIZATION FROM ANOTHER. Succeeding in business depends on how well you know your customers, how well you understand your business processes, and how effectively you run your operations. Increasingly, effective control of the supply chain process is differentiating world-class organizations from the also-rans. The improved provision of intelligence will facilitate these processes. The use of information and communications technology (ICT) initiated rapid and inexpensive ways of using customer requirements in various stages of the firms' planning processes (Dahan & Hauser 2002). Similarly, pre-CRM, Wal-Mart discovered that their retail customers were interested in good-quality, inexpensive merchandise in a clear, friendly environment. This led to the development of sophisticated information systems that were able to capture even small details about customer preferences (Gupta, 2000). Wal-Mart was able to change their business processes in advance of any IT implementation. Intelligent use of customer data can strengthen ties with an organization's most profitable customers. A company should also be able to attract others to targeted offers (Peppard, 2000). However, this can be achieved without formal CRM.

- MANAGEMENT ROLES MAY BE REDEFINED AS INFORMATION BECOMES CURRENCY (VALUABLE TO ORGANIZATIONS IN THE SAME WAY AS CAPITAL). Even extracting tangible business benefits from existing and future software may not be enough for some companies to survive in increasingly turbulent business environments (Fornandel, 2005). However, changing internal business processes to take advantage of the creation of external business networks may promote your future software development to a real business-winning opportunity (Ndede-Amadi, 2004). This would be especially true if your organization was able to obtain enough intelligence to add some certainty to its planning procedures.

- VIRTUAL ORGANIZATIONS MAY CONSIST OF ELEMENTS SUCH AS POWER, CULTURE, COMMUNICATION, KNOWLEDGE, AND PERCEPTIONS. Virtual communities can now exist amongst groups of people scattered around the world who interact using electronic media – telephones, e-mail, video-conferencing, etc. – and who may never meet physically at all (Boddy et al. 2002). In theory a virtual organization is a collection of geographically separated entities that are linked electronically. I.C.T. makes it easier to separate the various aspects of a business, and to perform them in geographically separate places. Firms that aspire to be virtual organizations may need to establish new norms of communication, decision-making, and possibly a common identity (Boddy et al. 2002). Bocij et al. (2003), used the hypothetical example of a 'virtual shoe company' which contracts seven other companies to: 1. research the shoe market, 2. design shoes, 3. make shoes, 4. advertise shoes, 5. transport to retailers, 6. sell shoes, and 7. do the accounts. Managing several enterprises across the globe will require the full range of management competencies and skills.

- THERE WILL BE A SIGNIFICANT INCREASE IN THE NUMBER OF SMEs USING ICT IN A STRATEGIC WAY. The majority of tools, techniques, and methodologies in the domain of information systems (IS) and information technology (IT) have been developed with large firms in mind (Maguire & Magrys, 2001). This is true of the support provided in the areas of project management; system development, risk management, benefits realisation, procurement, and the formulation of IS & IT strategies. In today's business environment the effective use of IS & IT can provide small firms with the opportunity to take advantage of information and communications technology. Developing intranets and linking into extranets will allow small firms to exploit the business benefits of information and communication technologies (ICT). This may allow SMEs to forge strategic alliances with other organizations. Creative use of the internet may also allow SMEs to take advantage of market opportunities. Small and medium-sized enterprises may be the big winners in the future. They may be agile and flexible enough to take advantage of even smaller quantities of BI. They may not be saddled with existing legacy systems that formalize the decision-making process in a time-consuming way. They may be in a better position to deal with unstructured and external intelligence. They may be able to be more efficient at filtering intelligence for their specific requirements (Maguire & Suluo, 2007).

Exhibit 1.3.

Mini Case: ICT Utilization

Marks & Spencer is to spend £450 million over three years (2007-9) to revamp its supply chain and supporting I.T. systems, and it aims to generate £500 million a year in sales from its website. Marks & Spencer wants to convert many more of their 27 million customers into regular on-line shoppers. To take advantage of ICT organizations must have key staff that is able to see the possibilities created by the strategic use of ICT. It is important that firms use these staff in a creative way to gain business benefits for their organizations.

Exhibit 1.4.

Mini Case: Sustaining IT Expertise

Twenty five per cent of businesses are having difficulty retaining ICT staff following a surge in demand, a recent study has revealed. Of the 300 organizations questioned, 40% said their biggest problem was finding staff with specialised skills and 38% said they were struggling to recruit ICT staff because of a lack of suitable candidates. The survey found that 90% of organizations are actively recruiting in all areas of IT, including development, technical services and operations/customer support, compared to 80% in 2004.

Flexibility of Information Systems & IT Infrastructure

Future-proo. ng technology investment is essential, and flexibility and scalability should be the key characteristics of, any IT infrastructure. Organizations require a solid ICT infrastructure. Infrastructure is a key area that is often overlooked. A flexible, secure, highly available infrastructure must be in place to be able to deliver services efficiently and effectively. Of course, the infrastructure is only the starting point in terms of the technology you will need to underpin managed services.

OUTSOURCING

Many organizations have outsourced their ICT as they may believe that they cannot be world-class in this particular area. They must ensure that the service provided by the outsourcer is secure and of a high quality. It is important that firms put in place **service. level. agreements. (SLA).** to guard against any decline in service. Technology such as remote fault diagnostics and resolution management, ticketing, telemetry, management reporting, technical support and content management are all necessary to support a managed service. Also, a stable, well maintained data centre is essential to the consistent operation of any service.

Your managed services provider will have designed and implemented a tried-and-tested approach for the delivery of managed services, which, hopefully, is built on best practice, cost savings and alignment with your business. If you insist the

Exhibit 1.5.

Mini Case: IT Outsourcing

Barclay's Bank has signed a six-year IT outsourcing deal with Accenture valued at more than $750 million. The contract to outsource the bank's application development division is one of the largest United Kingdom (UK) outsourcing deals of 2004 and follows a year of negotiations. More than 900 IT staff will transfer to Accenture and there will be no compulsory redundancy in the first two years of the contract. Barclays will retain overall responsibility for IT strategy development and will maintain staffing in selected areas.

provider has to adapt to a specific technology model and/or platform preferences, it is your company that may face the consequences.

Embarking on a managed services project is an upheaval for any company, but the advice for those of you considering this route is to make sure you have the right infrastructure in place. Look at all the available tools to help keep track of service delivery and measure results.

SECURITY AND STORAGE

To complement the above list, and in order to address and ensure smooth delivery of your services, it is essential that you address two more technology areas – security and storage. As with all businesses, security is paramount, so along with the almost universally deployed **firewalls** and **virus.sweepers** you should consider implementing information security technology such as intrusion detection systems. As regards storage, a good quality back-up solution will be required. Thought should be given during the provisioning of the service as to what the expected timescales for recovery need to be, as this will impact heavily upon on the back-up solution that you finally settle on. Firms rely on digital information even though security standards and regulations have not been fully implemented. One example of a standard that has been implemented is: ISO/IEC 17799:2005 (270002) which is a Code of Practice for Information Security Management (Layton, 2006).

This may be all well and good, and clearly the right technology needs to be in place for a managed services provision to work well, but as is the case with any IT investment process there will be pitfalls as well as positives. Probably one of the worst things you can do is to try to dictate the solution to the provider. **Dotcom.trading** is enjoying a boom, but its future depends on maintaining consumer trust.

The foremost area of concern for ICT directors in 2005 must be uncertainty in the business environment. In the UK we have seen economic recovery, with an attendant increase in ICT spend. Economic forecasters are predicting a decline towards the end of 2005, so we must be prepared to tighten our belts if this happens.

The Security Balancing Act

Security remains a perennial concern for all IT installations - spend too little time and effort and risk system corruption and failure, spend too much and run the risk of being labelled a "technology-obsessed nerd". With the Freedom of Information Act coming into force recently, government bodies will be preparing for access requests. At first sight this looks like an issue only for the public sector, but other implications are beginning to become apparent. For instance, if you bid for a government contract, do your tender documents, perhaps containing trade secrets, become public documents, and can this be prevented?

Government Regulations

In the United Kingdom (UK) the burden of regulation continues to grow, with many of the "regulated" industries reporting that up to 50% of their ICT spend is now going on regulation-related projects, and there seems to be no reduction in this. One wonders whether this spending is at the expense of other ICT initiatives, or whether it is "new money" raised through increasing the cost of services or reduced margins.

Whatever the source of the spending, it means greater responsibility for ICT leaders, who must get more involved in businesses' regulatory mechanisms. Clearly scandals such as Enron must be prevented, but we wonder whether this is really money well spent, or whether a different approach to fraud prevention could yield the same result without so much non-productive expenditure. Is this a case of attempting to find a technological remedy for a human behavioural problem?

In many instances organizations rely on government regulations or outside agencies to help them keep their ICT resource secure. COBIT—Control Objectives for Information and Related Technology—is an ICT control framework that aims to aid firms as they attempt to manage and monitor this ever-changing, complex resource (Brown & Nasuti, 2005). COBIT focuses on four main areas of ICT governance:

- Strategic alignment
- Value delivery
- Resource management &
- Performance measurement.

Similarly, the Information Technology Infrastructure Library (ITIL) provides an integrated, process-based, comprehensive framework for ICT service management. This will include both service delivery and service support. This may appear to cover operational rather than strategic issues. However, a key element of the framework is a valiant attempt at further integrating technology and business.

Complex Telecommunications

Supply of telecommunications seems set to remain complex in 2005, with increased demands on the **Chief Information Officer (CIO)** to retain connectivity between business units and provide for a wide range of remote workers. Although large businesses are able to procure reliable and economic connectivity, smaller firms still have to contend with poor service - the challenge to carriers must be to combine reliability with effective account management, configuration and maintenance.

Junk e-mail: Spam

A further challenge in the telecommunications area is the volume of **spam** - junk e-mail accounts for 90% of mail received in many businesses, and all estimates point to over 50% of internet capacity being used by these unauthorised messages. In all probability 2005 will see those that have not invested in a service such as Message labs doing so, but isn't it about time governments woke up to the billions of pounds of internet capacity absorbed by spam, and the millions being spent to keep the spam out?

Linking the Business with ICT

ICT leaders have the potential to grow in confidence in 2007. As we gain more knowledge about our businesses and the environments in which we operate, we can contribute to broader business direction. With this may come a new challenge - no longer will it be seen as surprising if the CIO contributes to overall business strategy, indeed, there could be an expectation that this will be so. And if there is this expectation, we must ensure that we deliver at the strategic as well as operational level.

Exhibit 1.6.

Mini Case: Profitability

The London Stock Exchange (LSE) has increased its record for the highest value of transactions processed in one day by more than £4,000,000,000 in less than six months thanks to the Tradelect trading platform. In August, 2007, the LSE processed a record £17.62 billion of transactions in one day on Tradelect which went live in June, exceeding the previous high of £17.16 billion. The system, a complex piece of in-house-developed middleware, reduces the time taken to complete a share trade to 10 milliseconds and allows 3,000 trades per second. The increase in business comes as the London Stock exchange prepares for increased competition from rival exchanges.

IT RISKS AND THE BUSINESS

Seven in ten chief information officers at UK companies believe their audit committees are ignoring the risks posed by IT to their business, new research has found. One third of internal audit heads at companies questioned in the same survey of 18 CIOs and 44 internal audit heads said they were not confident that their staff had the right skills and resources to make an effective assessment of the IT risks to their business. Despite the central role of IT in helping companies comply with a raft of corporate governance regulations only one quarter of respondents at organizations surveyed by professional services firm Ernst & Young said they carried out regular review of third-party service providers.

ICT risks include security breaches, the installation of new computer systems, and outsourcing agreements. Internal auditors also review the "ICT controls" in place to mitigate the risks posed by technology before making recommendations to the company board. Ernst & Young believe that the audit committee must be prepared to not only discuss but confidently challenge the ICT related threats, vulnerabilities and risks facing their business. It has even been suggested that the current powers of the Information Commissioner's Office (ICO) should be extended to allow it to inspect an organization's security and data protection procedures. There is even a call to undertake these tasks even if the organization is not in favour of this happening!

Future regulation increases the need for audit committees to understand ICT risks and implications for the business. Organizations must put greater focus on internal controls and governance structures. ICT controls failures or an inability to detect and resolve ICT control issues can carry heavy operational, financial and reputational risks, particularly when those risks become public knowledge. There is a shortage of staff with the skills and experience to carry out internal IT audits. Seventy per cent of companies surveyed said they had a dedicated internal IT audit department.

FUTURE TRENDS AND CONCLUSION

The ICT function can no longer be viewed as a separate entity within the 21st century global organization. The ICT function should be an integral part of all the modern organization's functional area. It should not have a policy of reacting to departmental needs – it should be proactive in ensuring that its company is at the forefront of technological change. It should be a catalyst for change within the organization.

However, this should not be change for change's sake. Each separate initiative should be comprehensively vetted to ensure it is not just 'old wine in new bottles'. This means that only the business-winning opportunities are highlighted for the effective organizations. Every firm is unique and it is important an environment is created that enables these organizations are able to take advantage of ICT change in areas that are of medium and long-term benefit.

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Chapter II
Linking Information to Business Strategies and Decision Making

Tracing business benefits back to ICT systems can be difficult. But when it comes to professional sports events such as the America's Cup, the systems used by sailing teams for navigation and diagnostics can make the difference between first place and the long walk home (Interview with Eric Ernst, ICT Manager for America's Cup Team Victory Challenge, August, 2007).

In essence, the collection of data and information is driven by the necessity of getting an insight from its analysis. The results of analysis are useful in making informed decisions for the purpose of delivering superior products and services, satisfying and locking-in existing customers, and attraction potential ones (Maguire and Suluo, 2007).

INTRODUCTION

The ultimate reason why organizations develop information systems is so that their employees can make good decisions. If firms did not make decisions there would be no pressing need to implement systems. We must always make sure that we do not lose sight of this fact. An organization should make it their business to document what decisions are made in the course of their business. It will be very important to prioritise these decisions. Which decisions are crucial to the organization? Do we need up-to-the-minute information before we can make a decision on that issue? What level of accuracy do we need before deciding on that point? i.e. quality assurance.

QUALITIES OF GOOD INFORMATION

- Accuracy
- Completeness
- Relevance
- Clarity
- Timeliness
- Reliability
- Communicated appropriately
- Correct Volume
- Acceptable Cost

Better Information leads to better **decision-making**. Inaccurate Information leads to ineffective decision-making. The organization's database or data warehouse must be accurate at all times. The firm must put sufficient resources into this area to ensure the integrity of its data. Making the wrong decisions can be dangerous for the organization and can lead to serious financial losses.

A number of criteria put forward by Henry Mintzberg (1974) over thirty years ago are still relevant today:

- In an ideal management information system (MIS), the rate of information bombarding the manager would be carefully controlled.
- Concentration on intelligent filtering of information is a key responsibility of the MIS.
- Careful determination of channels is necessary in MIS design.
- Stored information must be conveniently available to the manager.
- The information specialist must be sensitive to the manager's personal and organizational needs.

Decisions are made at different levels within the organization, i.e. Strategic Planning, Management Control & Operational Control. Herbert Simon was right to focus on the different decision-making modes that confront organizations:

- **Strategic Decision Making**: Involves establishing objectives for the organization, & outlining long-term plans to meet those objectives;
- **Tactical Decision Making**: Concerned with implementing decisions made at strategic level, e.g. allocating resources needed to meet organizational objectives and
- **Operational Decision Making**: Involve executing specific tasks to ensure they are carried out efficiently and effectively.

Over the last 40 years, different types of information systems have been developed to try and support the decision-making that takes place at the different levels within the organization:

- Transaction Processing Systems
- Management Information Systems
- Decision Support Systems
- Executive Information Systems
- Expert Systems
- Strategic Information systems

When developing a new information system an organization must be clear that information for decision-making is at the forefront of any justification to implement the I.S. It may be worthwhile to ask a series of questions to ensure that the new system can deliver accurate information for better decision-making.

Exhibit 2.1.

Mini Case: Data Mining

Data mining to expose insurance fraud networks has led to 74 arrests and a five-to-one return on investment in the Insurance Fraud Bureau's (IFB) first year. The IFB outsourced its data mining operations to Detica. The supplier's Netreval software applies social network analysis to huge amounts of data to identify and evaluate networks of individuals and organizations potentially involved in fraud. The IFB uploads claims data daily to Detica, which uses information such as names, addresses, birth dates and tip-offs to identify information relationships between claimants. Detica's leads have allowed police to seize goods worth £5.5 million under the Proceeds of Crime Act. This money can be used to repay insurers who have lost out to fraudsters. It is estimated that the arrests have saved insurers at least £8 million by disrupting gang activity.

1. Will information be available with the new system that was not previously available?
2. Will information be available when required?
3. Will current operations be improved with the new system?
4. Will the new system result in a reduction in clerical activity?
5. Will the new system contribute towards the maintenance of a competitive position?
6. Will it improve decision-making within the organization?
7. Will it lead to improvements in customer service?
8. Will further systems education be required by staff to enable them to use the new is?
9. Will training be required by staff before they can use the new is?
10. Will the new is causing any disruption within the organization?
11. Is any support required from staff to ensure the system is a success?
12. Will management have to put any extra resources into this particular system development?
13. Will users play an active role in system development?
14. Will users be involved in systems analysis?
15. Will users be involved in systems design?
16. Will users be involved during systems testing?
17. Will users be involved during parallel running of the system?
18. Will the new system be introduced using prototyping?
19. Will staff be part of project management user groups or steering committees?
20. Will staff receive any notice of the impending changes?

Once again, this is not an exhaustive list of questions but a starting point when trying to identify resourcing issues for new system development.

e develop information systems so that users can make better decisions. The only way the new information system can ensure that users make better decisions is through their continued involvement with the new system. This is especially crucial in the 21st Century with regard to e-commerce. In many cases customers are actually the new users of systems (Maguire and Ojiako, 2008). The integrity of the system and the information within it will have a major bearing on whether customers continue to avail themselves of its potential benefits (Turel et al 2008). It is of paramount importance that information systems staff involves decision-makers during the system development. It is essential that the existing staff within the organization have the required competences to take advantage of the information and intelligence provided by the new information system. This is becoming more important as increasing numbers of firms are purchasing business intelligence software.

To be effective at extracting intelligence from the business environment it may be necessary for a group of staff to have a well-defined set of key competences. An ability for visioning may be very important; expertise in strategic planning may be useful but this may be dependent on the amount of turbulence in the environment; there will certainly be a requirement for flexibility – a need to be proactive; being skilled in managing change may be crucial as business plans may require change on a regular basis; environmental scanning will be required as this process takes place as part of an open system. It is proposed that the role of *intelligence analyst* will become more and more important to organizations. It would be counter-productive for an organization to implement a system that they could not utilise to its fullest potential.

One of the most important indicators of a successful system implementation is whether users continue to use an IS over a significant period of time (Burton-Jones & Gallivan, 2007). Systems do tend to go into decline. Users do get disillusioned with IS. The integrity of data is not always what it should be. This is a crucial area for decision-making.

It is important that systems are monitored to identify the early warning signs of where a system may be going into decline. Managers should be in a good position to make decisions as to whether a system should continue to be used or not. Can this decline be halted or not? Does the information (data) that is output from the IS provide any added value to the organization?

One of the mysteries of system development is why 'live' systems are not used as much as expected. There may be many reasons for this but very few are identified before the system goes live. The original design of the IS may have been ill-conceived. This can often happen when staff that end up using the system – the decision-makers - are not involved to any great extent during the early stages of the development process. The users of the existing manual system are usually the best people to involve in deciding what the user interface should consist of when the system goes live.

If one assumes that the output from a system is information and that information is going to help a member of staff make a decision, then the relevance of that information for decision-making will have a significant effect on the level of system use. How many system designers actually know the decision-making alternatives available to managers in a dynamic environment? Different decisions are made at different times by different groups of staff depending on the circumstances (Cooke and Slack, 1991).

There are different ways of measuring IS effectiveness depending on the type of system that has been implemented. If an on-line system has been developed it may be possible to log the number of enquiries made to the system. That may, however, only give a quantitative analysis of the situation. It may be necessary to undertake a more in-depth study to gauge whether the response from the system has yielded information that has led to more *effective decisions* being made. It may be this qualitative analysis that will decide whether a system is effective or ineffective. Making the right decision could lead to the firm winning a lucrative contract or making a strategic alliance with another organization.

Another method that is currently being used by organizations to measure IS effectiveness is to measure the time that staff who are logged on to the system. This is a simplistic way to measure success. An alternative way of measuring IS effectiveness is by judging the level of user satisfaction. This can also be criticised for being too simplistic. However, satisfaction with a new system can lead to further benefits to the organization. These can include:

- Improved use of information
- Higher job satisfaction
- Staff turnover reduced
- Less resistance to change
- More flexibility of working
- Higher positive perceptions of management
- Higher positive perceptions of systems staff
- More likely to see Information Technology in a positive way
- Better teamwork
- Able to meet project deadlines
- Improved communications within the organization may be improved
- Willingness to feedback positive and negative issues re. the system
- Staff more likely to get involved with future projects.

SYSTEM ACCEPTABILITY

It is not acceptable that staff within an organization should be making decisions with inaccurate or insufficient data & information. The organization should have some 'early-warning' system that identifies when their systems are not providing an acceptable level of accurate data to make informed decisions.

It would be ideal for organizations if all parts of all their systems worked perfectly. The chances of even one system working perfectly are remote. Failing this organization must identify a *minimum level of acceptability* below which their system should not be used. The measurement of this will not be a one-off exercise. The implemented system should be constantly monitored to ensure that the level of system effectiveness does not go below the minimum level.

The majority of IS evaluations are undertaken when the system has only been live for a few weeks. All systems go into decline if they are not maintained properly or if the environment in which they are used is changing. It is becoming more common within organizations to see totally integrated systems being implemented. The benefits of integrated systems have been widely documented by system suppliers. This approach, however, requires that all systems are working perfectly with accurate data being transferred from one system to another. The consequences of having an ineffective system in one part of the organization could be disastrous to the overall success of the whole system.

It is important that early-warning signs of potential problems are identified by relevant staff. The monitoring of system effectiveness is a dynamic not a static process. The worst scenario for an organization is that decisions are being made using incorrect information. It is very unlikely that a database within any organization will be 100% correct at any point in time. As long as that is known by decision-makers contingency measures can be put in place to cater for this.

What may be more important, however, is that procedures are in place to ensure that the integrity of the database is maintained. Once again this will require the co-operation of several groups of staff. The feedback process that identifies errors in the system must be maintained during its life. If this feedback loop is broken the system will go into decline. It is not uncommon for organizations to continue using systems even when it is generally accepted that they have gone into terminal decline. In some situations this may only have a minimal effect on the overall effectiveness of the organization. In other cases it may have disastrous consequences.

The following questionnaire tries to identify issues that need to be addressed if an information system is to remain effective. One of the first questions is whether the information system still meets its original objectives. If the information system has taken several years to develop it may be necessary to revisit the original aims and objectives of the system. If the answer is 'no' to this question then some very difficult but necessary decisions will have to be made. In certain circumstances it may be possible to realign the system so that it remains useful to the organization. This is rare, however, and it is more likely a new system may have to be developed.

If the output from the system is not understood by the decision-makers in the organization or if the quality of information provided by the system is poor then major surgery may be required to make it effective again.

It will not be possible to change staff views overnight. If change is handled in a sympathetic way it may be possible to introduce information systems into organizations in an effective way. What level of participation are you going to have when you introduce information systems into your organization? What is the minimum level of co-operation that you will require from your staff to ensure that a particular system is going to be a success?

As existing users come to terms with the fact that the existing system they are quite skilled in using is going to be replaced there is likely to be a heightening of anxiety. This particular change issue has to be handled very carefully. The onus is on management and system developers to put more resources into helping staff manage the change process.

In many cases this could entail improving communications within the organization whereby staff are kept informed of all changes. In other cases it might be necessary to implement an education and training plan whereby staff can prepare for change in an incremental way - rather than being faced with an unrealistic changeover period. What benefits will the organization gain from putting more resources into the change process?

Research has shown that a change process based on user participation is more likely to be successful. A number of reasons for employing this approach as proposed by Lucas (1994) are:

1. Participation is ego-enhancing and builds self esteem, which results in more favourable attitudes.
2. Participation can be challenging and intrinsically satisfying, leading to positive attitudes.
3. Participation usually results in more commitment to change; commitment in this case means that a system will be used more.
4. Participating users become more knowledgeable about the change. Therefore, Users get to control more of the technical qualities of the system and become better trained to use it.
5. Technical quality will be better because participants know more about the old system than the information systems department.
6. Users can retain much of the control over their activities and should therefore have more favourable attitudes towards a change.

It is very important to try and ensure that users, systems staff and management continue to communicate throughout the life of a system. Historically there have been weak links in the communication between these groups of staff. IS staff, users and managers must see the system development as a team approach. There are a number of well-defined reasons why this approach may not be forthcoming:

Users are not always in a position to explain what they are looking for from a new system. Users cannot always participate in the system development - they may be unable to understand the technical aspects of the system development process (data flow diagrams, etc.).

In many instances users are unsure of what is in fact a major change process. If they are apprehensive of change they will not be able to play a comprehensive part in the system development.

Another issue that might affect the way that systems are developed is when systems staff does not have a good enough understanding of the user area where they are working. This could lead to a system being developed that suits the systems professional rather than the user. There is a feeling that some systems staff is unsympathetic to the needs of users. Further research has revealed that in a number of cases the systems professional may concentrate on technical efficiency at the expense of system effectiveness.

Often it is difficult enough agreeing the original system and very often users are unable to convey their system needs. A user may want a system that provides information to aid their decision-making. Very often, however, it is very difficult to explain how and why decisions are made. If IS staff spend only a limited amount of time in the user's area this can often lead to a lack of understanding of the decision making process.

Linking Information Systems to Effective Decision-Making

The following questions could be used as guidelines to evaluate the effectiveness of decision-making:

1. Does the IS meet its basic objectives?
2. Is the output from the system understood by users?
3. What is the quality of information provided by the current system?
4. Is the information provided for the system in the right format?
5. Is the output from the IS in the right format?
6. Is the information provided by the system at the right level of detail?
7. What are user attitudes to the current system?
8. Have these attitudes changed over time?
9. Is system use the same as when it went live?
10. Why have users stopped using the system?
11. Do users understand the present IS?
12. Has sufficient training been provided for users to understand the system?
13. What percentages of the facilities available are being used by staff?
14. What is the quality of documentation provided with the IS?
15. Does this affect the quality of decision-making?

Organizations should invest more time to ensure that the IS they are developing are providing sound business benefits. Historically the systems that can potentially provide the best return for a department or organization are not necessarily those that are developed first. This can lead to inefficiencies that may have long-term detrimental effects for the organization. There are very few IS applications that can be justified on tangible benefits alone. In most instances a combination of tangible and intangible benefits will be required to offset system costs.

The effectiveness of any ICT development will depend on whether it is value for money. Why would any organization develop a new system or purchase expensive software if, in the final analysis, the costs of the initiative outweigh any benefits?

The Feasibility Study

The **feasibility.study** is often viewed as a relevant precursor for any future development of a business case.

The feasibility study is necessary because:

- New systems can be very costly
- New systems can be very disruptive during implementation
- New systems can have far reaching effects on the way an organization conducts its business or is organised

It would be a good idea to set up a feasibility study group with well-defined terms of reference. This is because it is necessary to assess:

- **Technical.feasibility**
- **Social/organizational.feasibility**
- **Economic.feasibility** (cost/benefit analysis)

At the end there should be a detailed feasibility study report.

Different groups of staff can undertake different roles at the feasibility stage. Users can help evaluate the existing system as well as the proposed alternatives. They can also help to select an alternative for design. Information systems staff (IS) can play a major role in evaluating the various alternatives – using agreed criteria. Management should also play a hands-on role at this juncture. They should make a big effort to understand the various proposals. They should review the feasibility of the various proposed systems. They should make a major input into the choice from the various alternatives (Farbey et al. 1992).

Table 2.1 The information economics method

Appraisal.criteria.business.domain	
Strategic match	The extent to which the investment matches the strategic business goals.
Competitive advantage	The extent to which the investment contributes to an improvement of positioning in the market (e.g. Changes in industry structure, improvements of competitive positioning in the industry.
Management information	The extent to which the investment will inform management on core activities of the firm.
Competitive response	The extent to which not investing implies a risk; a timely investment contributes to strategic advantage.
Organizational risk	The extent to which new competencies are required.
Technology.domain	
Strategic information systems architecture	The extent to which the investment matches the IT plan and the required integration of IT applications.
Definitional uncertainty	The extent to which user requirements can be clearly defined.
Technical uncertainty	The extent to which new technical skills, hardware & software are required.
Infrastructure risk	The extent to which the investment requires additional infrastructure investments and the IT department is capable of supporting the proposed system.

The Information Economics Method

Table 2.1 shows the **information.economics.method** as suggested by Renkema (2000).

Investment Evaluation: Why is it critcal?

- Preventing misallocation of financial resources.
- Improving business performance.
- Creating a shared investment vision and capturing learning opportunities.
- Profitable exploitation of it-based infrastructure

Investment Evaluation

- Benefits are difficult to assess measure and manage.
- Costs are high and difficult to predict.
- Large uncertainties and major risks.
- Communication problems and stakeholder politics

This has often been used for capital investment decisions. However, the development of a business case is continuous and iterative process. There are three main stages to the formulation of a business case:

Strategic Background

- Justifying the investment through the organization's strategic plan.
- A precise assessment of the strategic context.
- Focuses on the development of the preferred option.
- Presents arguments for the planned investment.
- Demonstrates that the organization can deliver on time and within budget.

Business Environment

- Are our markets at least as strong as when the outline business case was first set up?

Competitive Position

- What have current or potential competitors been doing that may affect the organization's competitive position?

Financial Situation

- Have there been any changes in the organization's financial position that may significantly question the project's viability?

User/Customer Requirements

- Will the new system still meet the potential needs of our users/customers?

Outline Business Case

- Evaluating the options for change and identifying a preferred option for the organization that is within its budget constraints. it will also involve the evaluation of different capital options (i.e. using economic appraisal) to meet the organization's strategic objectives.

Full Business Case

- Once funding has been identified, validation of the outline business case and development of a detailed specification for the proposed scheme.

COST BENEFIT ANALYSIS

Corporations spend hundreds of billions of pounds worldwide on information and communications technology (ICT) but less than 20% of all corporations bother to set up some sort of programme for justifying expenditure in this area. At the same time it is estimated that fewer than one-fifth of all corporations have a process in place by which to cost-justify an ICT investment or determine if a new technology implementation will yield long-term corporate benefits. This is especially perplexing as ICT can affect the strategic nature of 21st century businesses (Oh & Pinsonneault, 2007).

As expenditure on information systems (IS) continues to increase rapidly it becomes more crucial for senior management to target funds to IS projects that will achieve the most benefits for the organization. This situation is against the backdrop of further research which suggests that the value of information is governed by the benefits generated by its optimal use. It is even suggested that the cost of information is independent of the scale of its use.

Few senior executives seem to understand why their investments in ICT have gone wrong or how to get them right in the future. One reason for this bewilderment is the difficulty in calculating the absolute value of information and communications technology to an organization. This is because ICT is too integrated into most businesses to be isolated as a variable. In addition, difficulties in measuring any such return on investments of ICT will be difficult as so many of the information technology costs are shared. Separating out the costs of one application versus another can be very challenging, particularly in a world in which the systems are distributed onto multiple technical platforms and substantial costs exist in areas such as the desktop personal computer (PC) and the local support of that desktop PC.

In order to solve this problem it is generally recognised that information technology decisions must be made like other business decisions, i.e. on the basis of value. It is also accepted that it is difficult to calculate the absolute value of information technology. As a result, it is usually accepted that ICT decisions must be made on the basis of value thus through a traditional cost/benefit methodology that is customised to address the issues unique to ICT decisions. One view is that the cost/benefit analysis is the answer to these problems as it appraises economic projects in terms of their net total benefits over total cost on the assumption that it is desirable to maximise the sum of producers' and consumers' surpluses

Cost-benefit analysis has a long history and its origins probably begin with the work of the French engineer and economist Jules Dupuit who established the foundations of what today would be called `marginal analysis'. Even though a sound cost/benefit methodology is necessary if companies are to make good ICT investment decisions, it is not sufficient. What is also required is a set of management processes that connect ICT decision making with its business context and to get the right people involved at the right time.

Cost/benefit analysis (CBA) is a well-established means of assessing the net value of a project. Used effectively, it should ensure that projects are not commenced unless there are net benefits. In theory it is a technique, well grounded in microeconomic and management accounting theory, for assessing the net social value of a programme or measure. The CBA essentially compares the gains and losses associated with an investment project. At the same time the CBA can be regarded as a procedure for evaluating the social worth of investment projects, programmes, and policies. Its vital feature being that it is based in the concept of economic efficiency.

CURRENT BUSINESS SITUATION

Only 25% of UK IT directors believe that measuring the value of IT investment is an important part of their job. This is the finding from a survey of 300 heads of IT in the public & private sectors. This comes at a time when IT heads have come under increasing pressure to demonstrate a quick return on IT investments to the board. Only 25% of the IT directors surveyed said their ability to measure and demonstrate the value of IT had a "significant impact" on their own success at work.

Most respondents admitted that they struggled to measure the benefits of IT investment, and 71% said their attempts to do so had been generally unsuccessful. Criteria used by IT directors to measure the value of IT included increased productivity (67%) and decreased costs (66%). A technology strategy partner at

Deloitte & Touche believes that demonstrating the value of IT to the firm should be the number one priority of these IT directors._

Despite the growing importance of IT to business only 9% of those surveyed saw themselves as leading the development of business strategy and 47% said they were involved in setting business goals and budgets.

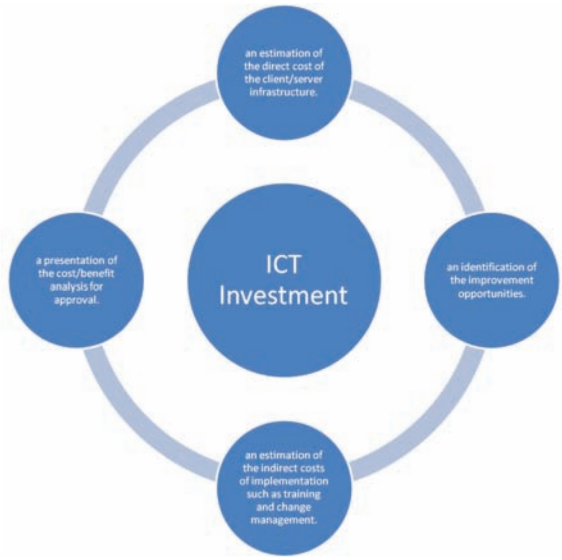
In any environment in which early investment is necessary in order to achieve a significantly later return, the evaluation of costs and benefits needs to take account of the time-value of money. Drawbacks of CBA include its misleading precision, and the scope for analyses to be manipulated to serve personal stakes. Some writers believe that a cost: benefit analysis methodology is not adequate for the evaluation of information systems applications, except when dealing only with cost-avoidance issues. These weaknesses can be addressed by clearly describing qualitative factors rather than using unjustified estimates to quantify them, and by clearly documenting the calculations whereby estimates are arrived at, and the assumptions underlying the estimating process. Others recommend adaptation of the information economics methodology which measures and justifies the technology on the basis of business performance as a better method.

It is also suggested that many companies have responded to these problems by falling back on a "total cost of ownership" (TCO) approach which was initially designed to identify and measure components of ICT expense beyond the initial cost of implementation. They, however, suggest that while TCO can be a useful tool to reduce on-going costs by improving ICT management practices, it is not a sound basis for decision making as the methodology has difficulty evaluating lifecycle costs. In addition, TCO focuses only on cost. It is accepted that the total cost of ownership process does have limitations in that it usually misses out consideration of one-time costs occasioned by the move to the new system, the ongoing increases in operating costs that arise when a company supports multiple technologies or standards and considerations for technical risk.

It is also suggested that a different framework is required to justify ICT investments. This is based on a wider perspective of the key elements as shown in Figure 2.1.

An important element of the cost/benefit analysis is the treatment of 'opportunity costs' that are usually defined as the benefits foregone from not having done something else with the resources. In summary, the cost/benefit technique involves the identification of all of the costs and benefits arising in relation to a project and to the extent, where it is practicable and economic, and their measurement. In decreasing order of desirability, the resulting data may comprise financial measures, financial estimates based on quantified measures, financial estimates based on quantified estimates, quantified measures of non-financial factors, quantified estimates, and qualitative descriptions.

Figure 2.1. ICT investment issues



A number of questions need to be asked concerning the way that organizations decide on system development:

- Who is involved in the decision to prioritise system development?
- Who prioritises your information system applications?
- Is there a steering committee in place that makes these decisions?
- Who are the clients in relation to any system development?
- Is the system being developed linked to a system development strategy?
- Have you reviewed the effectiveness of the techniques you have previously used?

Not all organizations have the same priorities. It is important to decide which priorities are important at a particular point in time.

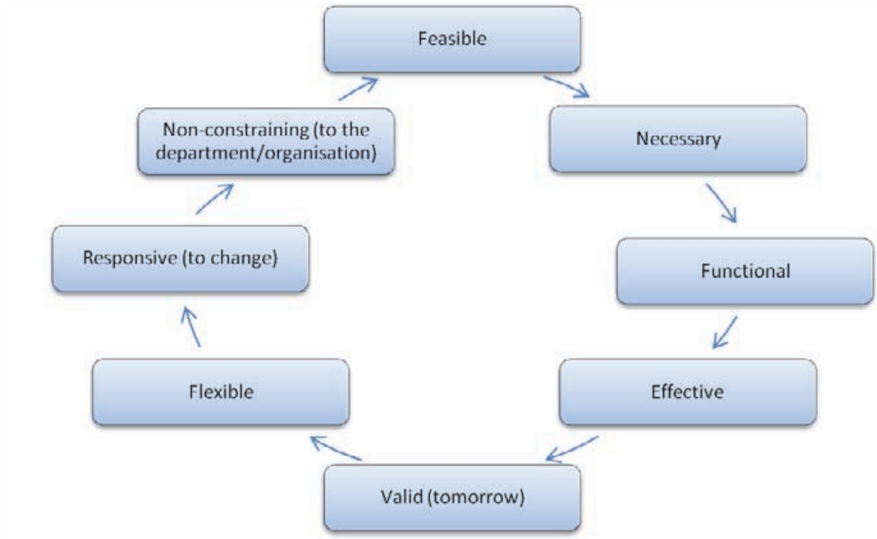
One simple checklist might be used to decide whether the system to be developed can be seen in Figure 2.2

It is important to think carefully about the criteria used for deciding which system to develop.

A number of criteria can be put forward:

1. *The system easiest to develop.* This might give the organization a quick success as it competes in the market-place with other firms. Fast-tracking the new system can give the firm a competitive advantage.

Figure 2.2. System development checklists



2. *The system with the shortest payback period.* This will certainly please the firm's accountants! The organization should try and ensure that the new information system can pay for itself quickly and not be reliant on some possible future benefits that never materialise.
3. *The system with the least disruption to the organization.* Many information systems that are developed often have dysfunctional effects. They disrupt existing ways of working and may have a detrimental effect on the company's relationship with their customers and suppliers.
4. *The system guaranteed to deliver benefits.* This may be wishful thinking as it is always difficult to guarantee financial benefits with any new information system. However, if the firm employs a very good business case and is extremely effective at producing an accurate cost-benefit analysis it may gain financially from a new system.
5. *The system that is most closely aligned to the goals of the organization.* The organization must strive to ensure that any new information system it develops actually underpins its existing and future business plans. The firm must be careful that even separate departments do not develop systems that may lead to sub-optimisation.
6. *The system that is politically acceptable.* In many instances firms must take a pragmatic approach to developing information systems. This could be an issue of prioritisation. Politics may lead to a senior executive getting a new system implemented ahead of another department or group of staff.

7. *The system that can be produced 'in house'.* It is quite common for organizations to use outside consultants as a means of developing new information systems. However, the organization may deem it important that a new system is developed 'in-house' using existing staff. This could be done for security and confidentiality reasons.
8. *The system that can be developed using existing technology.* The organization may decide that a new system should be developed using the existing information and communications technology infrastructure. They may have just invested in new technology and decided that they do not want to spend any more in this area. This may mean that a proposed system may have to be tailored to fit the existing requirements.
9. *The system that can be implemented with the support of users.* It is always a good idea to ensure that existing users are happy with the development of a new system. Their help is often needed at key stages of the system development life-cycle (SDLC). They are very important at the systems analysis, systems design, testing, maintenance, and evaluation stages of development.

In many situations the demand to have applications developed will be greater than the supply of skilled staff, user-time, processing power, etc. to develop them. This makes the issue of applications priority very important to organizations.

It is important that scarce development time and expertise is not tied up developing information systems (IS) that will not deliver important benefits to the organization. Even when these systems go live they are still taking up organization resources - maintenance, processing power, user time, stationery, etc.

One way you can help your department/organization is to critically assess not only the existing systems but also those that may give you added value in the future. This can be done more effectively as a group exercise.

Exhibit 2.2.

Mini Case: Security

It has often been recognised that business continuity and ICT security are an integral concern for keeping a business running and protecting the firm's business reputation. This must be an important part of any organization's business strategy. Your firm should not just pay lip service to this issue. Security and continuity issues should be a major part of your firm's business strategy. You may have to change your organization's processes and culture to counter these threats. Business continuity should be very high on the priority list especially as increasing numbers of firms are dependent on ICT for their business success.

It may be useful to have representatives from several relevant departments to review which systems are going to be the most important for the organization. This can be done most appropriately by using some form of measure - one way might be to analyse future benefits for the whole organization. This should undermine those trying to put forward narrow departmental viewpoints. If a ranked list is produced this must be monitored on an on-going basis as the needs of the organization are constantly changing. A checklist can be developed as follow:

- What investment appraisal techniques do you employ?
- Do your managers view information technology as an investment or a cost?
- Do you use cost-benefit analysis as a way of deciding on information projects?
- How do you cope with all the different stakeholders who are involved in system projects?
- How do you decide on the values that you put on intangible benefits?
- Does anyone refer to the cost-benefit analyses (CBA) when systems are implemented?
- If yes, what results have been revealed?

The most common approach that is used to decide whether a system should go ahead or not is a cost-benefit analysis, which compares the costs and benefits of introducing a system (this is covered in more detail in Part 3 of the book). In some organizations managers see the implementation of IS as a cost rather than a benefit. Many IS would not be developed if there was a direct comparison between tangible costs and tangible benefits. What usually make the difference are intangible benefits. They are important when putting together a 'business' case.

The following list of intangible benefits may be usefully examined:

1. The ability to obtain information previously unavailable.
2. The receipt of information on a timelier basis.
3. Improvements in operations.
4. The ability to perform calculations not possible before.
5. A reduction in clerical activity.
6. Maintenance of a competitive position.
7. Improvements in decision-making.
8. Improvements in image, customer service, etc.

There are a number of techniques that can be used to compare the costs and benefits that determine whether or not a system should be developed. Using the net present value concept, future savings are rolled back to their present discounted value and compared with the discounted value of the investment and operating costs for the system. If the discounted benefits exceed the costs, then the system is attractive from a cost-benefit point of view.

A similar measure can be used to determine the internal rate of return of a project. In this example the analyst attempts to determine the interest rate at which discounted benefits equal discounted costs. The pay back period is a simpler approach since it ignores interest rates. It is simply the length of time before the benefits exceed the costs. How long will it be before the benefits of the system payback the costs of developing it?

In many cases the effect of introducing an IS into an organization should not be seen in isolation. Most systems are linked, either directly or indirectly, to other systems within the organization (also outside the organization). In some instances this can have knock-on effects that are benefits, in other cases they can be perceived as being costs.

The cost-benefit analysis assumes that all relevant and politically feasible alternatives have been examined; that their costs and benefits can be identified; and that these costs and benefits can be expressed using a common denominator (i.e. pounds sterling). The cost-benefit analysis does not generate new alternatives. This leads to the problem that some alternatives are not even considered. Table 2.2 shows the costs and benefits of ICT systems.

It is very unusual for an information system to be justified on purely tangible benefit grounds. In most instances it is usually a combination of tangible and tangible benefits that will be a trigger to commence an information systems project (Maguire et al 2007). Even in areas where it appears that benefits are bound to accrue from going ahead with the purchase or development of a system it is not always clear cut. There are a number of reasons why CRM implementations may not always fulfil their potential (Turban et al, 2004; Ward and Daniel, 2006). In the first instance there are few tangible benefits that can be directly attributed to CRM. Even with intangible benefits they may be difficult to measure. There may have been a failure to identify and focus on specific business problems. As with many other recent initiatives senior management may not fully sponsor CRM. In some instances there may be poor user acceptance, i.e. sales staff. Probably a more fundamental issue is where organizations use CRM as a way of automating a poorly defined business process. It is very important that CRM systems are evaluated for their practicality in the work environment (Xu & Walton, 2005)

It is interesting to note that in Europe CRM is viewed as being at a strategic level whereas in the United States it is seen as a tactical issue for most organizations (Jessup & Valacich, 2006). A CRM implementation in Europe costs on average $7 million as opposed to $4 million in the United States. There appears to be some agreement that CRM systems do cost considerable sums to install effectively

Table 2.2. Costs and benefits of ICT systems

Costs of Systems	Benefits of Systems
Implementation costs	Tangible - Cost Savings
- Computer Time - Technical Staff - User Time - Cost of Packages	Increased productivity Low operational costs Reduced workforce Lower computer expenses Lower outside supplier costs
Operational Costs	
- Computer Time - Additional equipment - Software maintenance - Operating Staff - User Time - Supplies - On-going training costs - Facility costs	Tangible - Cost Avoidance Lower clerical and professional costs Reduced rate of growth in expenses Reduced facility costs Intangible Improved asset utilisation Improved resource control Improved organizational planning Improved organizational flexibility More timely information More information Increased organizational learning Legal requirements attained Enhanced employee goodwill Increased job satisfaction Improved decision-making Improved operations Higher client satisfaction Better corporate image

within organizations (Ward and Daniel, 2006; Jessup & Valacich, 2006). Even with a considerable investment there is no guarantee that benefits will be realised in the short-term. It may require organizations to put in place strict performance measures for the efficient and effective use of CRM (Luftman, 2000). This may lead to better forecasting based on known demand and therefore improved production planning.

At a basic level it may be possible for an organization to gather information during the course of its usual business that can be used to increase profitability whilst also making sure that customer needs are addressed more closely, i.e. Boot's the chemists customer loyalty card scheme. The first step could be to put in the appropriate information technology and business processes, followed up with multimedia, multi-channel communications with customers leading ultimately to a personalised sales relationship.

BUSINESS STRATEGY AND COMMUNICATIONS

Communications within organizations are never perfect. Many organizations can be very efficient in developing strategic plans but very poor in communicating these strategies to the rest of the organization. In future many managers will want their systems to guarantee 'business' success. IS permeate throughout most levels of the organization and not all staff will have been involved in the drawing up of business plans and mission statements, so communication with them is vital.

It is important to gauge the level of consensus amongst staff about the aims and goals of the organization. Without a general knowledge and understanding of the direction in which the organization is moving it may be difficult to gain the commitment of staff to changes in systems. The following questionnaire should help you to identify the planning processes within your organization. It should also enable you to identify the level of participation by staff in the process. It may be even more important for small and medium-sized enterprises as they take further steps towards justifying their investment in information and communications technology (ICT). The choice of answers is only indicative and you can change them to suit your requirements.

Figure 2.3. Awareness questions

Business Awareness Workshop

Background

Effective IS should underpin the business objectives of the organization. Information strategies should lead to managers having the right information available to make effective decisions. IS can then be developed to provide this information.

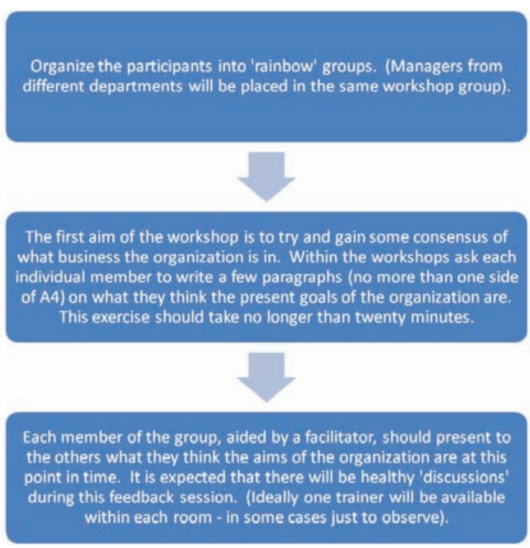
An IT strategy can then be put in place to support these initiatives. If this approach is adopted, the organization can have confidence in the link between the investment in information technology and business success. To ensure the success of this strategy there must be widespread agreement of what the objectives of the organization are. One way of getting this process in motion is to provide a forum so that staff can discuss what they believe to be the organization's business objectives.

Session One

The presentation should take no more than ten minutes with questions.

It is hoped that this group (multifunctional) can arrive at some consensus about what they believe the organizational objectives to be. There is no point in putting strict time constraints on this exercise, as some useful learning should be gained. (The trainers should try and facilitate this particular exercise). The output from

Figure 2.4. Flowchart of business awareness workshop



this session should be a mission statement that will meet the organization's business objectives for the next three years. (If there is already an existing mission statement this is not a problem - a healthy debate will ensue about how relevant it is in the present climate. Those who haven't seen it will also benefit from the discussions).

The rainbow groups should spend forty minutes developing this mission statement as well as a list of objectives for the next three years.

After the presentations have been completed a longer break should be taken where the course participants leave the room. The trainers/facilitators can then assess the findings of the groups to identify the next process.

When the participants return they will be asked to try and identify an *organizational* mission statement. (This is very important as each group/functional area will have a different view of the business the organization is in. There are bound to be differences in departmental objectives but any process that increases overall business awareness can only be beneficial to the organization).

This session is likely to be controversial. A successful outcome would be when the workshop feels:

1 They understand more clearly what the overall business objectives of the organization are at this point in time.
2 They are aware of the specific problems/aspirations of their colleagues across the whole organization. (Just as important for organizational effectiveness).

This particular approach is directed towards defining the readiness to learn within the organization in question. To be good at integrating information and business strategies it is necessary to be able to learn about the different environments in which we carry out our business activities. One issue appears to be of paramount importance – we are all trying to do our jobs at a time of major change. This makes the outcome of any planning process difficult to predict. What organizational requirements need to be introduced to cater for a learning environment? How do we institute those requirements? What are the essential characteristics of a learning environment? They may include:

1. Knowledge about the 'environment'.
    - What have been the changes to and composition of our business environment in the recent past?
    - What could be the changes to the environment in the future? Can we monitor any changes effectively?
    - What affect have these changes had on our staff and the decisions they make?

2. Do we have sufficient knowledge about our customer needs and the quality of our present service?
    - How do we monitor the needs of our customers?
    - How do we measure the effectiveness of our present service?
    - Are we in a position to change to meet the changing needs of our customers?
    - Do we have to educate and train our staff to enable them to react to changing needs?
    - Is it possible to put in place a training and education strategy now to try and pre-empt future changes in the environment?
3. Is it possible to encourage a receptive climate/culture so that when changes do occur we are able to react in a more beneficial way?
    - Can we produce a culture whereby change is seen as a positive response to circumstances rather than something that must be avoided to retain the status quo?
4. Can we maintain the self-esteem of our employees as we undergo these change processes?
    - What methods should we employ to ensure this actually happens?
    - Are we able to always involve our staff in major change?
    - Do they feel they are part of any strategy that the organization is trying to put in place?
5. What level of participation can we give to our staff?
    - When we are ready to implement a change process do we tell them what is going to happen?
    - Do we involve them in the planning stage so that they feel they are part of any new system?
    - Do we present our staff with a fait accompli whenever change is introduced so that they feel alienated with the process from the start?
6. Is the commitment to the development of people at a high enough level within our organization?
    - Is training and education seen as a cost or an investment?
    - What percentage of the overall budget is spent is on training as part of an overall strategy and how much is on ad hoc training and education?
7. Do the IS we have in place at the present time directly support the objectives of the organization?
    - Who has developed the organizational systems you use at the present time?
    - How often do you review the systems that you use?
    - Who decides whether a system is not performing effectively?

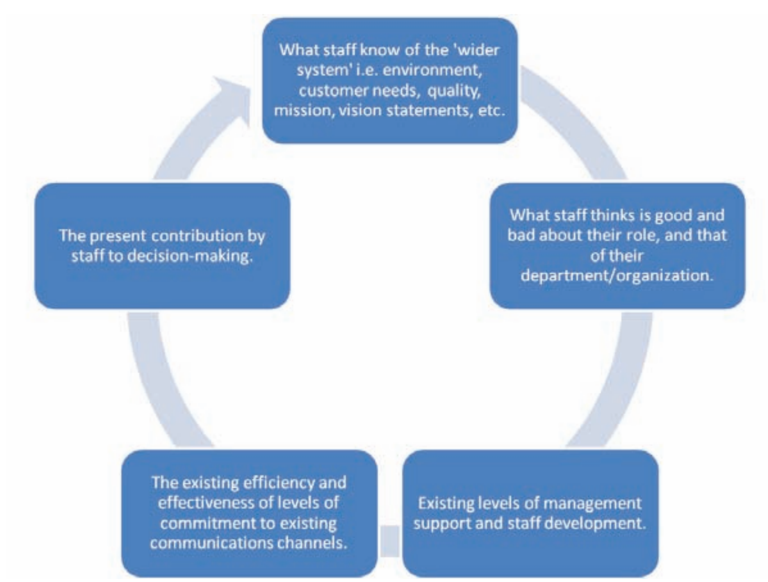
8. Are you able to promote learning opportunities for your staff?
   - Do you feel they are being 'developed' to cope with changes to the environment, organization, working practices, etc.?
   - Are your staff able to gain access to education and training that will help them respond to major changes, i.e. information technology?
9. Does your department have the communication structure in place that would allow the effective diffusion of change?
   - Can change be communicated effectively so that all levels within the organization can identify with it and also give their support to it?
10. Do you have a departmental/organizational mission statement?
    - What role do staff play in the development of the mission statement?
    - Who monitors adherence to this particular mission statement?

Subsequent Sessions

It is possible to develop questionnaires, undergo interviews and analyse observations to determine issues as shown in Figure 2.5.

If a department within your organization is concerned about their current status in relation to a learning environment they should be able to develop an action plan that will determine how to achieve an environment more conducive to learning by discussions, workshops, meetings and debate.

Figure 2.5. Issues in interviews and analyse observations



Eventually, the organization will need to make a decision on buying software and systems to support their business plans.

The Practicalities of Purchasing Software

In many cases the ideal software an organization would like to purchase for its information needs is not available. This often leads to a number of difficult choices having to be made. Before any software is purchased it should be matched against a set of agreed criteria. Within these there will be certain minimum levels of attainment for the software. These minimum levels of attainment cannot always be used universally across the whole organization, i.e. sites with many highly trained systems staff will require less support from suppliers than those with little or no systems expertise.

There are many advantages and disadvantages to be taken into consideration when deciding whether to develop applications in-house rather than to purchase available software or packages. A set of criteria should be developed to ensure that if software is bought it meets certain technical requirements:

- **Quality.and.Reliability...**Evidence from existing users should be collected, if possible, to determine how the software has actually performed.
- **Documentation.** Can the IT department fully understand the system and is it capable of making the necessary modifications based on the documentation provided?
- **Supplier.Stability.and.Support.** Will the supplier stay in business and are they committed to improving the software and issuing subsequent versions of it?

Exhibit 2.3.

Mini Case: ICT Investment

More than 40% of executive firms from SMEs say they have wasted money on an ICT investment. The main reasons given by directors were that they did not have a clear understanding of what the business required from ICT. They also experienced unexpected problems when integrating systems. Of the 3,080 companies surveyed by financial software supplier SAGE, 41% said they had received poor customer service from their supplier. 44% of SMEs with more than 100 staff said they had wasted money on IT. Businesses are unlikely to turn to a supplier for help. A third of respondents said friends, family, and colleagues were the main sources of advice.

- **Compatibility.** How compatible is the current software with current equipment and applications? If it is necessary to spend half the package price to modify the package, it is probably not worth buying it.

Many SME Have Problems Integrating ICT

One of the biggest problems within many organizations at the present time is that the large investment in hardware and software is not always being matched by an investment in skilled systems staff. This is resulting in more dependence on outside organizations to supply not only the software but also the support that goes with it. This is especially true with small and medium-sized organizations (SMEs). If they are able to align their business and ICT strategies, and complement this with competencies in key areas they will be able to take advantage of future business-winning opportunities.

This may lead to a degraded level of service as outside organizations will often not be able to understand and deliver on specialised, local problems. With software that is widely available the issue of support may not be a major problem. If, however,

Exhibit 2.4.

Mini Case: Contribution of ICT

Technology can be a catalyst – both to drive innovation and to enable it. It can play a vital part in new products, services, channels, market-entry strategies, operational transformation and industry-altering business models. Technology can even able other innovation enablers such as collaboration. But capitalising on all this potential requires combining business and market insights with technological know-how. This happens inherently in a start up endeavour because the entrepreneur is the embodiment of integration. But if you are past those early stages, you have to drive it differently. Business and market needs and opportunities should be evaluated in concert with technological possibilities – and this needs to happen early, when strategies are first being developed.

Over time technology can become so ingrained in day-to-day operations that continued use and investment happens by default rather than by explicit choice. Before you can evaluate the impact that new technologies or changes in technology investment might have on profitability, you may need to take a step back and ascertain which existing technology investments are aligned with which the software developed has been specially tailored for a department by one supplier there may be a number of security, financial, and support issues to consider.

A worst-case scenario would be a situation where many errors are found in a piece of software, and these problems are recurrent, and the level of software support is not up to standard. This could be where a 'help-desk' is not adequately manned. The main headquarters of the supporting organization could be many miles away. Another situation could be where the organization has taken on too much work or a key member of staff who has supported your site in the past has left the company. Not all suppliers will have a track record in supplying to this particular sector.

In many cases software will be available to solve a particular problem in your organization. What tends to happen, however, is that the available software can satisfy 80% of your needs. The other twenty-per cent is not available 'off the shelf'. Unfortunately, it is often this last 20% that is the most expensive to develop. If an organization has specialised in providing broad-based, generalised software for the market-place it can survive by selling large numbers of that package. If, however, a software supplier specialises in highly specific, tailored, software, the cost will be high. As there may only be one or two suppliers of this software the chances are that the maintenance and support charges will be high as well.

The following questionnaire will give your organization feedback on such issues as: the applicability of the new IS; how long it may serve the needs of the organi-

Exhibit 2.5.

Mini Case: Key Performance Indicators

Increasing numbers of organizations are setting up outsourcing contracts with outside suppliers. These arrangements normally cover hardware and software. It could be argued that these firms are putting a very important strategic resource into the hands of outsiders. Your firm must ensure that safeguards are in place to ensure quality of service as well as software for future years. It is crucial that there is no confusion about what is expected from these outsourcing suppliers. Any mistakes in formulating service level agreements can be expensive for both the user and the supplier. This could affect projects as well as the profitability of the firm. Service Level Agreements should be formulated that clearly define the firm's requirements. Key Performance Indicators should be identified and agreed by both 'sides'. If Service Level Agreements are too detailed, too complex or too long, it will be difficult for staff to understand and use them on a regular basis. If staff does not use the agreements it could lead to problems or disputes in the future.

zation; whether the new IS is compatible with existing systems; and is the system able to be upgraded. Once again the range of choices to the questions is indicative and you can amend them to suit your needs.

Organizational Objectives

1. At what level/s within the organization will the system be used?
   Organization wide/ Department/ Sub-Department/ Individual

2. Have systems been implemented smoothly in the past?
   No/ Some Problems/ Yes

3. What perceptions do staff have of IS?
   Dislike/ Neutral/ Like them

4. What kind of tasks and decisions is the information system designed to assist?
   Operational/Tactical/Strategic

5. When is it likely the system will have to be replaced?
   6 months/ 1 year/ 1-2 years/ 2-3 years/ 3 years plus

6. Is it likely that new technology will make this system obsolete?
   6 months/ 1 year/ 1-2 years/ 2-3 years/ 3 years+

7. Does this IS have the support and understanding of top management?
   Yes/ Don't know/ No

The.Information.Systems/Software

8. What quality control procedures are in place to ensure that the IS will satisfy organizational needs?
   *None/ Don't know/ Some procedures/ Every procedure require*d

9. Is this IS being used by an organization elsewhere?
   Yes/ Don't know/ No

10. If yes (Q9), can you contact existing users to determine how the system has actually performed?
    Yes/ No

11. Has the IS an adequate level of documentation to ensure that it can be used effectively within your organization?
    Yes/ Can be improved/ No

12. How compatible is the new IS with current applications?
    Very/ Unsure/ Not very

13. Will the new information system require a hardware upgrade?
    Yes/ Don't know/ No

14. Will the supplier of the information system/software continue to improve the package?
    Yes/ No

It is hoped by addressing these questions your organization should be in a good position to assess the current and future status of your information systems resource. An important part of your information strategy might be to try and ensure that you are not using untested software and systems. This could have serious repercussions for your firm if you cannot get the required maintenance for your software and hardware. An increasing number of organizations are linking their systems with other firms. It is important that compatibility issues are addressed at an early stage. Even attempting to answer the questions in the above list should focus your firm's attention on key ICT issues that will affect your business for the next few years.

FUTURE TRENDS AND CONCLUSION

This chapter has focused on a number of important activities that the 21st century firm will have to undertake to remain competitive in an ever-changing business environment. ICT developments should never take place independently of an organization's business plans. There are in fact no ICT projects – but only business projects.

No organization would consider developing an information system if overall costs were to outweigh overall benefits. If the proposed system is not feasible it should not even be considered. The formulation of a business case should be viewed as an on-going, live activity. Situations change and it is imperative that firms continually reassess their current and future circumstances in relation to ICT. SMEs may find it difficult to justify investing in a full business case activity. However the cost/benefit analysis gives them the opportunity to analyse the full range of tangible and intangible costs and benefits.

The cost: benefit analysis should be used in a positive way to ensure that any ICT projects can deliver for the organization. However, these business benefits should be virtually guaranteed for the organization. It is not good business practice to spend 4 or 5 years developing a new system that once implemented provides only 1 or 2 years of effective usage before it needs replacing.

Modern organizations working in dynamic business environments must view information & intelligence as key elements of their success. In reality information systems (IS) are only a means to an end. The real end is to ensure that staff within your organization are given accurate information and intelligence so that they can make effective decisions for the overall benefit of the firm.

However, how many organizations know why their staff makes decisions or what information they need to make better decisions. Putting a new IS into your organization will not necessarily lead to better decisions being made for the good of your organization. What information and intelligence is out there in the business environment that could make our organizations more effective? We need to constantly monitor an ever-changing situation with regard to ensuring that the information we use for decision-making is at least timely, accurate and relevant. Anything less and we will make costly decisions for our companies.

Organization-wide systems such as Enterprise Resource Planning (ERP) will by their very nature involve the vast majority of staff within the firm. The well being of the whole organization may depend on the successful implementation of such systems. It is extremely important, therefore, that there is a strong correlation between the systems and the long-term business requirements of the firm.

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Chapter III
Developing and Implementing an ICT Strategy

You and your business need also to face up to your financial responsibilities. By virtue of your company's size you will most likely not be in the position to recover quickly from ostentatious expenditure. It is imperative that you quantify the cost of ICT, looking at the total cost of ownership. It is also incumbent on you to calculate a well-defined return on investment path (Computer Weekly 2007).

Chief Information Officers (CIOs) need to adopt a venture capitalist approach to I.T. if they are to remain relevant in the prevailing climate of economic growth. This means getting to know the growth plans of the business intimately and determining how to use the resources within I.T. to contribute directly to that growth. CIOs must also consult with the business to shape the demands of I.T. to ensure growth, and not just support (Gartner, July, 2007).

INTRODUCTION

The introduction of new IS can often have a significant effect on the business practices within an organization. It is important that a lack of understanding of cultural

& political issues does not have a detrimental effect on the way that information is used within the organization. New IS often resulting in staff receiving information that they have previously been unable to obtain. It is important that staff to have a greater awareness of issues that might work against a team approach to resolving problems in an ever-changing environment. It is hoped that staff is aware of the specific problems and able to weight the importance of understanding the goals and specifically the information that are crucial to the rest of the organization.

CREATION OF IT AWARENESS

Many organizations are striving to improve organizational effectiveness by the improved use of information. **Information.awareness** can be increase by getting members of the organization from all departments to attend workshop that focus on information related issues.

It is observed that with a vast amount of data within many organizations it is therefore imperative for an organization to be able to synthesize and extract high quality information. Another way of improving organizational effectiveness is

Exhibit 3.1.

Mini Case: ICT Off-shoring

Firms considering off-shoring should develop I.T. strategies to exploit the growing capabilities of Chinese and Indian I.T. consultancies and software developers, analyst firm Gartner has advised. China and India are beginning to collaborate to offer U.K. firms sophisticated I.T. consultancy and software development services that will match the quality of Western suppliers by 2010, Gartner said. Gartner continued by saying Indian firms bring world-class software expertise and leadership in global markets and Chinese partners have legions of capable, low-cost employees and greater know-how with clients in Japan, Korea and other Asian countries where English is less prevalent. Far from being simply a source of cheap labour, both countries will soon be able to compete for global business on competence and capability. China and India are producing some of the world's best-trained computer science and electrical engineering graduates. In 1995-6 India's exports of I.T. services were worth about$1m, and in 2004 they were worth $13 billion. In 2000, India's share of business process outsourcing was worth $148 million. In 2004 it was worth $3.6 billion (www.computerweekly.com/it-outsourcing).

Exhibit 3.2.

Mini Case: ICT Skill and Resources

IT directors have serious concerns about the skills and resources of the teams used by company boards to identify IT-related risks to the business. This is very important for any organization developing an ICT strategy. Examples of ICT-related risks include computer viruses, the installation of new computer systems and outsourcing agreements. Controls could include a firewall to block hackers or the way applications are configured to block employee access to commercially confidential information. However, almost three-quarters of chief information officers (CIOs) and internal audit heads at large United Kingdom (UK) companies questioned by Ernst & Young said their audit committees were ignoring the risks posed by ICT to their business.

to analyse the various systems as business processes. Stand-alone systems have one major advantage - the repercussions of making errors in one department may have a minimal effect on other departments. There is a change of culture in an organization in relation to information and IS perception. The introduction of large integrated systems (i.e. Enterprise Resource Planning ERP) has meant that information is crossing many departmental boundaries both electronically as well as manually. Increasingly these ERP systems are being rolled-out across a range of geographical, industrial and business areas. Rolling out packaged software across multi-site organizations will have a major effect on the various business units (van Fenema et al. 2007).

As the managers' grapple with the added **complexity** of the new situation, this will result in a major **cultural.change**. Therefore, there is a need to raise the awareness of issues such as the quality of information within the organization so that the need is clearly identified. In order to achieve this, setting up a **team.approach** that utilizes the use of information/information systems within organizations is required. The approach is recommended to include several groups of staff:

- Managers
- Information Systems Professionals
- Users
- Trainers/Human Resource Management/Personnel

This workshop will be able to identify the information flows between business processes undertaken in an organization. It is important that representatives from a majority of departments are included within the workshop. Other organizations that interface with your organization could be involved to gain even more benefit from this particular workshop.

First Session

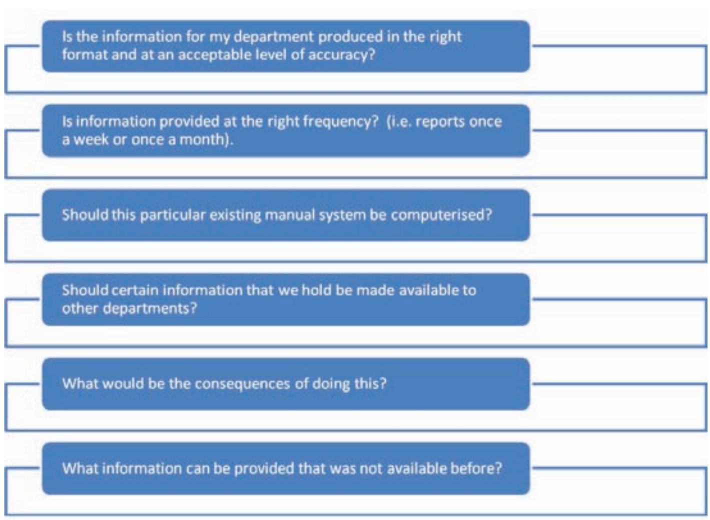
The first department will present their 'map' of business processes and information flows to the other groups. At the end of this individual presentation there will be a number of loose ends to tie up. It is important in this workshop that all groups are allowed to present, as each group will learn from the other corresponding groups. Further interaction between the groups will be required.

Two important questions should be asked:

1. Do the expectations of this particular department, in relation to information inflows and outflows, match up to the expectations of the corresponding departments?
2. If they don't, how can the departments co-operate so that a more effective situation would result?

To answer these questions it may be necessary to set up a number of smaller group workshops. An ideal outcome from this particular workshop would be to produce an *organizational information flow* (owned by the whole group) whereby the information needed to support business processes can be identified across all

Figure 3.1. Flow chart of information identification



departments. Discussions should also take place (either the whole groups or subgrou*ps) that will identify such as issues shown in Figure 3.1.*

Outcomes

One set of possible outcomes during the session is staff may see that information is available within the organization however they do not have the sources to acquire the information. By developing an IT strategy, there will be less chance of duplicate systems being developed as departments become more aware of each others' information needs. This should lead to more cooperation within and between the various departments (something that will be vital as more integrated systems are introduced).

Strategic Alignment

This section will begin by taking a critical look at the benefits and disadvantages of strategic alignment, it will then go on to discuss strategic information systems planning and finally it will introduce you to a way of implementing an ICT strategy based on information engineering.

Major benefits may accrue to your organization by aligning your business, systems, and human resource management strategies (strategic alignment). At the confluence of these three areas it is anticipated that major improvements to effectiveness can be gained.

Strategic.alignment has been given prominence within the private and public sectors over the last few years (Kearns & Sabherwal, 2007). The concept of strategic alignment relates to the ability of management to think, plan, and act in the three domains of business, information, and human resources (Ernst & Young, 1990). This presents management with a major change management problem. Recent research has shown the importance of understanding the dynamics of I.S. strategy and the firm's business strategy with regard to planning horizons (Newkirk et al. 2008).

The **transformation.trajectory** for an organization is a moving target, shaped by the fundamental changes in the competitive business world. Management's current challenge is to continuously adapt the organizational and technological capabilities to be in dynamic alignment with the chosen business vision (Venkatraman, 1994).

The **management-of-change** issues related to information system development may be reduced if the whole process is seen as part of a wider strategy. Research has identified the potential gains to organizations of linking business, information and human resource management strategies. This has come to be known as 'strategic alignment'. This puts extra pressure on the organization to manage change in several different areas of the organization.

Failure to plan at this strategic level may lead to organizations failing to benefit from the introduction of new information systems. There is little evidence to show that organizations are equipped to take advantage of the benefits that may be possible from adopting strategic alignment (Avison et al. 2004). One way of achieving strategic alignment is by ensuring that your firm has a strategic perspective when planning to develop its future information systems portfolio. One way of doing this is through strategic information systems planning.

Organizations must plan so as to gain the appropriate commitment to and involvement in strategic information systems planning (Galliers, 1991). By its very nature it requires the involvement of middle and senior management for its success. Many firms have problems with information systems implementation. They must ensure they adopt the appropriate strategy from a feasibility as well as desirability standpoint. The linkage with the business strategy is of paramount importance. It has been argued for many years that firms should not just manage ICT but oversee the realisation of business benefits through the adoption of ICT (Peppard, 2007).

STRATEGIC INFORMATION SYSTEMS PLANNING

Strategic.information.systems.planning (SISP) is:

- Dependent on the attitude, commitment & involvement of management.
- Linked to the current status of the company with respect to is/it; the manner in which the IS function is organised; & the strategic information systems planning (SISP) skills available.
- Requires the ability to measure, review or assess the benefits of SISP (in terms of outcomes and the process itself).
- Linking or taking into account the business strategy.

In many organizations, there has been a deficiency in:

- Gaining appropriate commitment to, and involvement in, SISP on the part of middle & senior management.
- Implementing information systems strategies due to an inappropriate choice of strategy - from a feasibility as well as desirability standpoint.
- Reviewing & assessing the benefits of SISP in the context of the differing expectations of different stakeholders.

It seems that Marks & Spencer (M&S), the increasingly global food and clothing retailer, is prepared to undertake strategic information systems planning even at a time of falling revenues. M&S is banking on increasing international and online sales and so the retailer is spending in the region of £450 million on new ICT in the next three years. The company intends to develop a modern and streamlined logistics network with new overseas warehouses to replace those that were originally set up in the 1970s. They are also planning to set up offshore stockholding and consolidation facilities (Computer Weekly 2008).

If information technology *is* implemented as part of an overall strategy the organization should gain benefits. It is important to invest in the appropriate information technology in order to get the most out of your investment. In order to do so, the technology must be implemented in such a way that the technical, economic and strategic effects of ICT are in line with corporate strategy (Bjornsson & Lundegard, 1992).

The argument for strategic alignment is based on the fact that there would be limited value in considering any one of those domains in isolation. At one extreme information technology could become integrated within the organization's core business processes (Yetton, Johnston & Craig 1993). At the very least information technology should underpin the organization's business strategy.

Historically, information systems have been used to develop systems in discrete areas, i.e. payroll, stock control, etc. However, with integrated systems there are much greater problems of planning and control that need to be addressed. It is a very complex project to manage. It is very important to ensure that what is desirable is also feasible (Churchman, 1979).

Another problem for organization that wishes to achieve strategic alignment is that within organizations, there are often departments who are striving to optimise their performance and ignore the expense of their colleagues in other departments. It is because managers of modern organizations, using a narrow point of view are striving to maximise their inputs, growth, resources, functions and short-term needs.

These managers confront the system designer with a strong argument for recommending action on the organization's behalf that may result in a weakening of the whole system of which it is a part, and a reduction in the quality of their reciprocal interdependencies such that the organization, and the whole, are worse off for having taken the seemingly obvious step for improvement (Churchman 1968a, 1968b).

Not all academics are convinced that strategic alignment has proven benefits for the organization. Sillince and Frost (1995) have found very few empirical studies that support the need for alignment. They also have found little evidence to demonstrate how business and information strategies interact. Venkatraman (1994) has also questioned whether there is any logic in aligning information technology and information systems strategies.

In many organizations, systems development is seen as a separate issue isolated from the other business areas of the organization. There is now an increasing awareness of the possible beneficial effects of employing a policy of strategic alignment within organizations. However, strategic alignment in itself may not go far enough in accepting the importance of the cultural and political issues discussed in the previous section. It also makes the overall change process even more complex for the organization. Recent research has highlighted the need to understand the key social dynamics of an organization prior to contemplating IS implementation. System developers should be aware of the core values of stakeholders within the firm as well as power and control issues that might influence the project (Silva & Hirschheim 2007).

INFORMATION SYSTEMS STRATEGY

There are many approaches to developing ICT strategies. An **information.systems. strategy**:

- Should be regarded as an integral part of the business planning process.
- Requires the commitment & involvement of senior managers.
- Requires a pragmatic approach to ensure a meaningful result in a sensible timeframe.
- Focus attention on effectiveness rather than efficiency.
- May require a formal project methodology.

In developing an information systems strategy, the form must try and ensure that it is:

Exhibit 3.3.

Mini Case: ERP Standardization

Rolls-Royce has completed the standardisation of its Enterprise Resource Planning (ERP) systems across the business to support its global I.T. model. Traditionally, the company has operated factories independently, but the standardisation of systems and processes means they can operate more effectively on a global scale. Standardisation across 29 international sites enables the company to run manufacturing operations, project management, financial systems, human resources, and material requirements planning off a single SAP implementation.

Exhibit 3.4.

Mini Case: ICT Risks Prevention

Cadbury Schweppes have developed a company-wide standard – enterprise architecture – to ensure information technology (I.T.) components are used across software systems. They developed the strategy following difficulties with large I.T. projects – including the implementation of a global enterprise resource planning (ERP) system in 2004. In 2006, this was blamed for a £12 million loss in its United Kingdom business alone. However, they adopted a strategy to improve the way I.T. delivers projects to the business; to reduce risks with large I.T. project roll-outs: and to enable the business to adapt more easily and quickly to change. Emanating from this strategy was a set of good practice issues for any large organization in the same situation: 1. Manage the institutionalisation – rolling out enterprise architecture is just like other change programmes. 2. Link benefits to business objectives that are real and relevant. 3. Form a powerful coalition of supporters in the business. 4. Communicate wherever and whenever you can, and keep it snappy. 5. Demonstrate how investing in enterprise architecture creates value (adapted from ***www.computerweekly.com/216379*** *16/10/2007)*

- Business-led and aligned with business plans.
- It should involve a wide cross-section of personnel in the organization.
- Priorities should be identified.
- Plans & actions should be formulated and agreed.
- Eventually a technical infrastructure & systems architecture will be developed or adopted. this may be the ICT platform that your organization decides to use as part of their strategy.

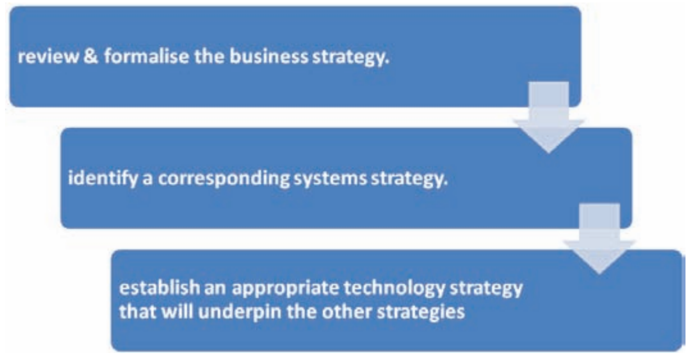
The aim of the ICT strategy should be that it is based on:

- Actions (not necessarily a document).
- It should be: constantly evolving & owned by everyone.
- There should be a clear linkage with the organization's business strategy.

The ICT strategy must be undertaken using a pragmatic approach to ensure that:

- Results are achieved in a sensible timeframe.
- That the conclusions are based on an up to date view of the current business requirements.

Figure 3.2. Three simple steps of ICT strategy



- The available techniques are used sensibly
- The results can be justified.

The approach will only work if:

1. There is a clear business strategy
2. New is/it opportunities are found.
3. An organizational structure and culture is developed that will support business needs.
4. There is harmony between the IS and business functions.
5. There is a better dialogue between is/it and the business areas.

Developing an ICT Strategy

There are many methods in developing an ICT strategy. The following is a five stages method based on information engineering as described in Figure 3.3.

FUTURE TRENDS AND CONCLUSION

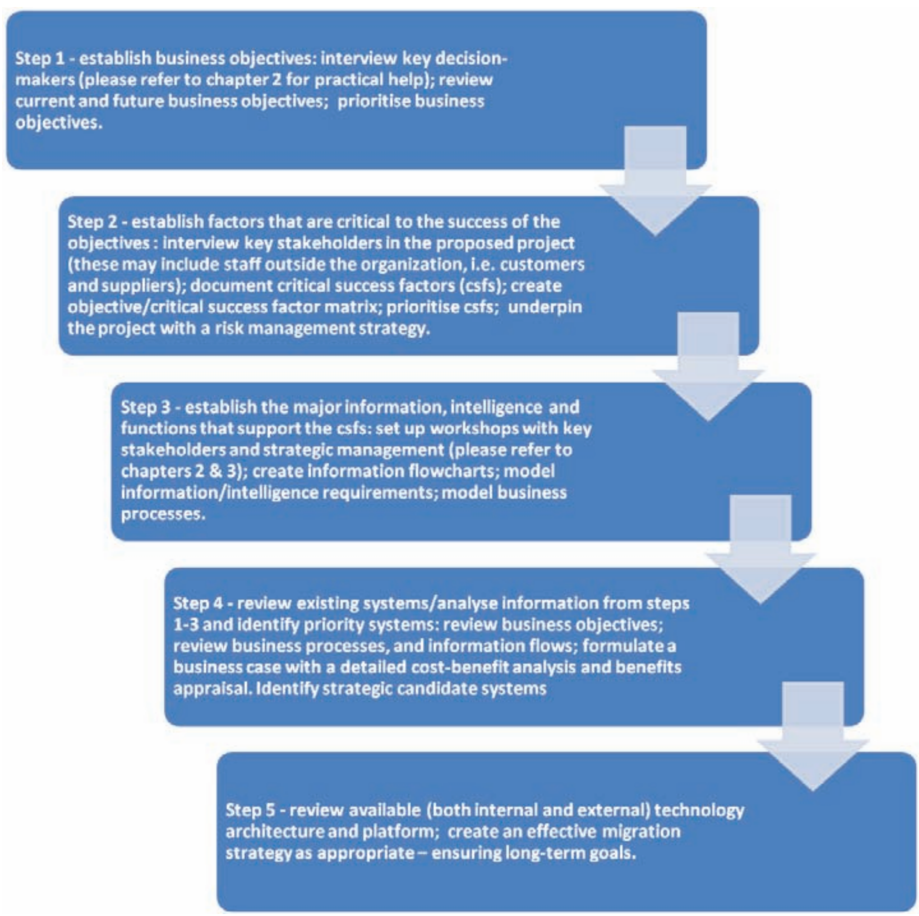
Many small and medium-sized enterprises (SMEs) are unlikely to have the resources (financial, manpower, and technological) to consistently develop and implement ICT strategies. However, they may have advantages in other areas. They may be agile enough to change course very quickly when new ICT arrives in the business domain. They are not 'weighed down' by existing technology. They may also be able to implement new ICT quicker than many of their competitors. This agility may give them 'first mover' advantage.

Exhibit 3.5

Mini Case: Competitive Advantage

As global connectivity reduces transaction and collaboration costs, companies are taking advantage of the expertise and scale that lies hidden in their own organizations and across the globe. They are assembling a business model fashioned from groups of "specialised" capabilities – combining internal expertise and scale through shared services centres with the capabilities of specialised partners to create truly differentiating business designs (I.B.M. Expanding the Innovation Horizon, the Global CEO Study 2006).

Figure 3.3 Flowchart of ICT development



These SMEs will be able to develop new systems without the need for the range of tools, techniques, and methodologies that may encumber larger firms. In the future it may be the larger organizations who are striving to become more flexible in the development and implementation of new systems. Rapid Applications Development and 'fast-tracking' may become the norm for even the largest of organizations. Their difficulty will be to reconcile the previous and current methods that they have been using for their ICT developments.

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Chapter IV
Strategic Alliances Through the Use of ICT

Reuters expects to save £150 million over the next 10 years through a £500 million outsourcing deal, led by Fujitsu Services to revamp and manage the media company's internal I.T. infrastructure (Computer Weekly 2007).

In a move that has sparked intense debate, "The New York Stock Exchange (NYSE) is using off-the-shelf technology (Netezza) to cut the time taken to access Business Critical data on its network from up to 26 hours to just over 2 minutes (Computer Weekly 2008).

INTRODUCTION

It is important for today's dynamic organizations to develop a strong and sustainable links with outside organizations and agencies. It may be necessary for your firm to have robust links with your customers and suppliers. It may also be necessary for your firm to set up links with other organizations in what have become known as strategic alliances.

Strategic Alliances are joint developments or alliances. They may only be for the lifetime of a project. Some may be much formalized, inter-organizational arrangements. There can also be very loose arrangements of cooperation and informal networking between organizations, with no shareholding or ownership involved (Johnson & Scholes, 2003). More recently purchasers and suppliers have been able to develop more tightly coupled links through electronic integration. However, there is a requirement to undertake further research across a range of business sectors (Grover & Saeed, 2007).

Why should organizations even consider setting up a strategic alliance? The main benefit of a strategic alliance is a *situation where 'partners' can achieve more jointly than they could independently.*

Explained in a different way a strategic alliance is:

An alliance of resources or programmes between two or more independent organizations designed to increase the marketing potential of each organization, i.e. symbiotic marketing (Varadarajan & Rajaratnam, 1986).

They can be viewed as:

- Formal coalitions between 2 or more firms for short or long-term ventures emanating from opportunistic or permanent relationships that evolve into a form of partnership among players (Hax & Majluf 1991).

Developing information systems across organizational boundaries can lead to potential problems in the area of project and change management. By their very nature these system developments will be complex as political and cultural issues may be at the forefront of these projects. In many instances a myriad of different stakeholders may need to be accommodated before progress can be made. Those stakeholders with high interest in the new system may lack the power to implement it (Boonstra et al. 2008).

Depending on the type of circumstances in which they are set up and the environment in which firms are working strategic alliances are Relationships where partners bring a particular skill or resource, usually one that is complementary, and by joining forces both are expected to profit from the others experience (Jeannet & Hennessey, 1992).

Increasing numbers of organizations are straining to make their supply chain management more effective under the pressure of increased competition. Strategic alliances may be the answer if they are viewed as a stream of **value-chain** activities where alliances enable each stage to be accomplished with the help of a partner, i.e. the marketing of a product (Stafford, 2002).

Exhibit 4.1.

Mini Case: Benefits of ICT Integration

In the United Kingdom (UK) the three emergency services - police, ambulance service, and fire brigade - have always acted independently in relation to the initial request for help. Each service had separate call centers where specialist staff fielded these requests. The initial 999 call went through British Telecom. In the late 1990s several 'shared control room' pilot projects were set up to try and identify synergies that may materialize through this joint working. The projects have been supported by the UK Government. The three services have been using a common ICT platform that still allows the individual emergency services to use specialist software. It was anticipated that the services may share strategic information in relation to first-responder situations. There are obvious ethical issues involved with the sharing of information, i.e. should the ambulance staff tell the police when they have responded to a drugs overdose call? One of the pilot projects is an area that covers a cluster of chemical works. An emergency call in this area will probably require a joint response from the 3 services. In these situations seconds could save lives! The tragedy of 9/11 in the United States put in sharp focus the need for the emergency services to use integrated ICT as a base line for more effective responses at times of emergency.

Exhibit 4.2.

Mini Case: New Business Model through Strategic Alliances

Porto Media is an example of a company that has relied on strategic partners to establish a totally new business model. The company had developed proprietary technology that enabled fast loading of digital content onto flash media cards. It envisioned a totally new business where customers could download music and movies onto these cards from kiosks at retail locations and play the content on compatible devices such as handheld players, phones or home media centres. The success of its new business model depended on two factors: Porto Media had to convince content providers that their content would be protected and used appropriately, and it needed a way to deliver that content to a network of retail locations. Through collaboration with 4C (a consortium comprising Intel, IBM, Toshiba and Matsushita), Porto Media found a solution to its content protection dilemma (I.B.M. Expanding the Innovation Horizon, the Global CEO Study 2006).

Exhibit 4.3.

<u>Mini Case: Supply Chain Collaboration</u>

Nestle has completed a trial of a ground-breaking supply chain project which has allowed suppliers to view its information and ensure it can meet fluctuations in demand for its products. The project has seen the consumer goods giant connect its Newcastle-upon-Tyne plant to its packaging supplier SCA, allowing a direct link between the enterprise resource planning (ERP) systems of the two companies. This means that SCA is automatically and instantly notified of Nestle's packaging requirements.

It is also important for firms to ensure that upstream and downstream activities are integrated within the business processes of the organization. This is another form of strategic alliance as companies try and tightly couple their supplier and customer relationships. Recently, organizations are rearranging their businesses processes to take advantage of the plethora of customer relationship management (CRM) systems and software that is available in the market place. These strategic alliances are becoming increasingly dependent on effective information and communications technology (Maguire et al. 2007).

The use of information and communications technology (ICT) in the design and development of Customer Relationship Management (CRM) systems has recently gained prominence (Bose, 2002, Xu et al. 2002, Ahn et al 2003). The importance of efficient data mining for the effective implementation of CRM has also been viewed as important (Berry & Linoff, 2000, Lee & Siau 2001). This shows how broad CRM can be viewed in relation to software development. It is argued that the appropriate CRM technology combined with the re-engineering of sales-related business processes should lead to increased company profitability. At the very least CRM is seen as a way of supporting the interaction between the firm and its customers. CRM concentrates on downstream information flows (Jessup & Valacich, 2006). However, firms can share their knowledge of customers with suppliers to provide a more **<u>integrated.service</u>** for customers (Gupta, 2000). The whole supply chain could be made more effective to ensure improved customer service. The difficulty for many firms may be to instil in suppliers the same values and standards that they have in relation to identifying the specific requirements of customers.

Exhibit 4.4.

Mini Case: Utilization of ERP through Strategic Alliance

The largest player in the worldwide enterprise resource planning (ERP) market, the German company SAP, has recently acquired the business intelligence software company – Business Objects – for £3.4 billion pounds. It is anticipated this will boost SAP's enterprise reporting tools. Together SAP and Business Objects intend to offer software that uses real-time data analysis to enable companies to improve decision-making. Companies currently using Business Objects software include Virgin, which uses it for store-based web-reporting, and Tesco, which runs the software as part of a centralised management information system (MIS) to create a single set of key business performance indicators across the company. SAP already possessed business intelligence software but this is a clear indication that they view this part of ERP to be an essential part of their future strategy. SAP is expected to use Business Objects as an alternative to the existing Hyperion. It should also give them access to new geographical markets. This should happen even though it is intended that Business Objects will operate separately and will not be locked into SAP (adapted from **www.computerweekly.com/227286** *16/10/2007).*

Why Strategic Alliances?

There are other reasons why firms decide to set up strategic alliances. Firms enter alliances because political or cultural differences can be solved more easily compared to a merger or acquisition. Two businesses working together by joint research efforts, sharing technology, joint use of production facilities, marketing one another's products, or joining forces to manufacture components or assembled products (Thompson & Strickland 1995).

Why might your organization decide to set up a strategic alliance? The formation of strategic alliances may give what is shown in Figure 4.1.

More specifically strategic alliances could lead to sharing trade information on technology and markets (see Exhibit 4.5).

In some instances the alliances may work against the organization as it may increase the power of certain groups. Increasingly with **Enterprise. Resource. Planning** (ERP) alliances are made on the vendor side and, therefore, equip them with extra power in areas such as contracting. This can work the other way, i.e. all the National Health Service (U.K.) agencies could band together when purchasing products. This should allow them to get good discounts.

Figure 4.1. A continuous process for strategic alliances formation

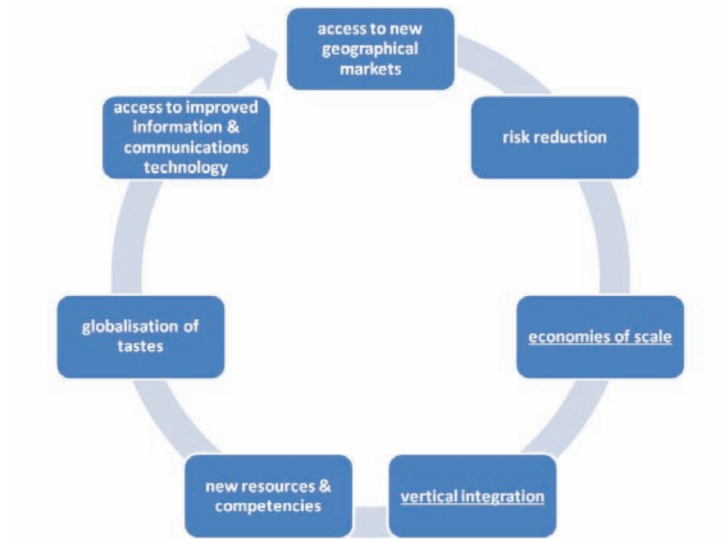

Exhibit 4.5.

<u>Mini Case: Edinburgh (Scotland) City Council</u>

Edinburgh (Scotland) City Council has renegotiated its 10-year I.T. infrastructure deal with British Telecom (BT) to reduce I.T. costs. The savings have enabled the council to pass on a reduction of £9 per person in council tax bills to the public. The project, which is set to free up £23.3 million over 10 years, will also allow the council to plough back savings into alternative I.T. projects. Their head of e-government said, "These savings represent 10% of our I.T. budget and have allowed us to reinvest in a self-service human resources system and a new school administration system". The savings follow an 18-month project to build a new I.T. infrastructure based on Microsoft Windows and Exchange. The council has simplified its I.T. systems, consolidated its servers and introduced technology to manage I.T. remotely to reduce technical support costs. The council has reduced the number of desktop applications from 4,500 to 400, lowering I.T. maintenance and reducing costs.

These alliances may be short-term or long-term. This is immaterial as what is usually more important is the quality of your existing systems and your **<u>ICT.infrastructure</u>**. Do you have systems that are compatible with those firms who you are setting up an alliance? What are the consequences of this? Can you purchase some **<u>middleware</u>** that might overcome those compatibility issues?

It is generally accepted that:

- ICT will allow organizations to share information more readily.
- through the use of extranets agencies will work together to form '***information alliances'***.
- ICT will allow private and public sector organizations to become more effective through the sharing of information.

Exhibit 4.6.

Mini Case: Saving through ICT Implementation

The Royal Air Force (RAF) has saved £300 million after aerospace manufacturer BAE systems installed a web-based enterprise resource planning (ERP) system to speed maintenance of the Tornado aircraft. The ERP system has cut the inventory of spare parts the RAF base holds, halved maintenance man-hours, and enabled 85% of spare parts to be available within one hour. There is a growing trend towards running maintenance on military sites in partnership with the armed forces. The eCapability product manager at BAE stated:

"The challenge is deploying an ERP application in an environment that already has highly joined-up I.T. systems. These systems have to interact with staff in-house and outside with suppliers".

This is obviously a delicate balancing act for organizations working in such a strategic area. The Ministry of Defence awarded BAE Systems the £947 million 10-year ERP contract in December, 2006. BAE Systems tailored IFS (a software supplier) Applications 2001 and 2004 software to run using a web interface. The system allows RAF and BAE staff to review orders, check maintenance schedules and demand forecasts across several databases. BAE has also incorporated a business intelligence component from Cognos software for reporting performance. The project director at BAE said the integration of the technology with the RAF's business processes had been challenging – they had to consult extensively with users to ensure benefits. He pointed out that the business and the information systems are an integrated capability – they must work together for benefits to accrue (based on ***www.computerweekly.com/227127*** *23/10/2007).*

To complement these organizations may require more flexible managers who have a range of competences to allow them to work effectively in dynamic business environments (Jones et al. 2006). This flexible manager will have the:

- Awareness of & ability to relate to the economic, social & political environment.
- Ability to manage in a turbulent environment.
- Ability to manage with complex organization structures.
- Vision to be innovative & to initiate change.
- Competences to manage & utilise increasingly sophisticated information systems.
- Ability to managing people with widely different values and expectations.

The pace of change has increased the burden on many organizations to be proactive in responding to environmental change. It is often not sufficient to make changes in working practices but to undertake this within predefined timescales. The smart organizations will encompass enough early warning feedback in their systems to ensure that current and future projects are safeguarded from outside influences.

Innovative thinking about practices, procedures and systems may improve the effectiveness of on-going projects. It is anticipated that by taking a different view of your organization several areas for improvement will be revealed. However, change should only occur when it is clear that it will be of long-term benefit to your organization.

FUTURE TRENDS AND CONCLUSION

Historically information systems have been developed internally within organizations or software has been purchased for internal use. However, the power of ICT is its ability to shrink time and distance. ICT enables organizations to link with customers and suppliers. It also allows firms to develop strategic alliances with other companies – either temporarily or for the longer term. It also allows for inter-agency cooperation in the public sector. Increased integration of systems across national boundaries may help in areas such as crime detection. If health services across the globe had similar software we could take ill in Melbourne, Australia and have our patient record available on-line even though we live in Denver, Colorado!

The use of the internet and extranets can give extra power to SMEs. A small firm may not be able to provide a full service to a potential customer. However, with the use of ICT this firm can link up with several other small firms to provide a 'one stop shop' in areas such as travel and tourism. One firm in Germany markets a range of holidays, another firm in the U.K. uses ICT to provide integrated ticketing arrangements, and another firm in South Africa uses the internet for showing videos of potential safari holidays. Individually, the service is adequate; together they provide a customer-focused package of care.

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Chapter V
Planning and Managing ICT Change

Change management is the top concern for I.T. directors for a second year running. A survey of more than 200 I.T. leaders at this year's I.T. Directors Forum revealed that 47% believe managing change is the most important issue they face, up from 42.1% in 2006 (www.computerweekly.com/225114 - 2007)

A mission-critical I.T. project to replace hard copy intelligence on threats to United Kingdom (UK) security with a secure network that links government offices in the UK and overseas is due for completion in 2009 – five years later than originally planned (Tony Collins, Computer Weekly – www.computerweekly.com/225663).

INTRODUCTION

Information Systems (IS) has borrowed many techniques from other disciplines. However, many of these have been borrowed from areas where the outcome from projects is more certain. Virtually all projects are liable to have changing requirements. In IS there are so many variables that need to be considered before, during, and after a project has been completed. It is one thing to identify what those variables are and another to react to the changing circumstances.

The question IS must address is whether it is inevitable that projects of a certain size and length will fail to deliver expected benefits. IS is trying to hit a moving target. The 'contract' for a new information system is agreed at a comparatively early stage. All parties agree on requirements and the project team retreats to build the system. This can be a lengthy process. For a change in the process to take place participants must agree that the change is worthwhile. The system developers would be much happier with a fixed set of requirements.

The methodologies that support this process tend to provide more emphasis on control at the expense of planning. They would be more appropriate in static business environments. Even in this situation there will be project failures. The initial premise for an IS project should be that *there will be change.* The methodologies should then provide enough flexibility to allow for the forthcoming changes. Ideally a vision of the implemented system should be formulated at an early stage.

One certainty of the IS development process appears to be that change will take place when the system is installed. From changing one line of code to implementing an inter-organizational information system change will occur. It is only the scale of change that will be different. This chapter will debate the issues surrounding the current way we develop information systems and attempt to identify the areas that could be changed to make the process more effective in the future.

A hands-on approach to understanding the management of **ICT.change** will be used within this chapter. It is hoped that it will pay dividends for any organization contemplating any kind of technological change.

Exhibit 5.1.

Mini Case: Change Management

Change management is the top concern for information technology (I.T.) directors for the second year running in a survey of more than 200 I.T. leaders at this year's (2007) I.T. Directors Forum. Considering the climate of rapid, continual and ubiquitous technological innovation, the increase is no surprise, said Roger Ellis, chairman of the I.T. Directors Network. He warned that the scale of change made it an even bigger challenge to manage that change, while keeping the business going. Dave Aron, vice-president and research director at analyst firm Gartner, said the lack of a standard or framework to guide I.T. directors is one of the main reasons why change management continues to be a major challenge. Another contributing factor is the lack of skills in change management and, more specifically, leadership skills in this area. (www.computerweekly.com/225114).

QUESTIONNAIRES AND WORKSHOPS

It is unlikely that all staff have the same level of competence when involved in the development of a system. People have different perceptions about the development of particular IS and these perceptions can change over the lifetime of a project. The resistance to change of staff can have a significant effect on the success or failure of an IS. There are stages of a system development where the co-operation and commitment of users is crucial - most notably during analysis, design, testing and implementation.

A recent consultative document from one large organization stated that:

Any attempt to install sophisticated IS before the service has the skills to implement and operate them and to exploit their potential would only impede the very changes that they were aimed at assisting.

A methodology is required that will ensure participation, mutual agreement, and shared objectives throughout the whole organization. Many organizations have undertaken change without understanding the intricacies of the change process. It

Exhibit 5.2.

Mini Case: Innovation through ICT

Two out of every three Chief Executive Officers (CEOs) we interviewed said they need to drive fundamental change within their organizations over the next two years. To no one's surprise, CEOs indicated the profound need to innovate in order to achieve this change. But this study gives us a richer view of how leaders are driving that innovation. We see that the innovation mix matters – and that business models should be prime targets for innovation. We understand how collaboration, partnering and technology integration are inexorably linked to innovation – and which areas of weakness need to be addressed quickly. And we are confronted with the truth that CEOs must personally orchestrate innovation, establishing conditions that ignite innovative ideas and driving their execution. The CEOs who participated in our study are eyeing a much wider innovation horizon. They are poised to seize opportunities and we are hopeful that the innovative momentum rising in these 765 organizations and their peers around the globe will spill over into solutions for our world (I.B.M. Expanding the Innovation Horizon, the Global CEO Study 2006).

can be argued that the successful introduction of IS into organizations is largely about effective ICT change management. The successful adoption, or otherwise of ICT is a complex process and dependent on many different factors (Jensen & Aanestad, 2007).

The introduction of a new IS into an organization can often prove to be a traumatic experience for all concerned. Active participation by users in the system development process may make the difference between a successful or an unsuccessful project. This process, and how it is undertaken, is often more important than the product (the system) itself. It is important that we understand what the repercussions are, for all concerned, of this process. There appears to be a growing amount of change in organizations. Some IS can be implemented without dramatically affecting working practices - but that is rarely the case with ICT

Most organizations will have experienced the introduction of an IS in the last five years. There will have been many experiences - both good and bad - that we can learn from. There are many examples where organizations implement a computer system which has been a failure. There can be many reasons for this: behavioural, organizational, financial, environmental, the system itself, etc.

Some of the reasons may be outside the influence of the organization and its staff. There will be many more examples, however, where the reasons for failure could have been avoided. What is unusual is that many organizations make the same mistakes over again. This may be because they spend too little time analysing what the problems were the first time around. Another problem is that they do not make the correct diagnosis and concentrate on the wrong issues during their review.

This questionnaire attempts to identify the main issues from a users' perspective. It attempts to concentrate on a "market-led" (the environment in which the system is going to be implemented) rather than a "product-led" (technical issues) analysis of the crucial issues (Maguire, 2000). It is hoped that data can be collected from the respondents that might identify what needs to be done in future to ensure IS success. It is expected that other issues will have been addressed during the conventional post-implementation review.

The actual undertaking of the questionnaire could improve relations between users and IS staff. It is hoped that if the questionnaire is completed at the early stages of system development potential problems with an implemented system can be alleviated at an early stage.

Resistance to Change Questionnaire

1. Have any new I.S. been implemented in your organization in the last five years?
   Yes/No

2. How did the new system compare to the old one?
Much worse/worse/the same/better/much better

3. Were you involved in the last change process?
Yes/No

4. What was your role in the process?
Substantial/limited/minimal

5. How much notice were you given before implementation of the changes that took place?
Over 2 years/over 1 year/6mths/3mths/none

6. How did managers/is staff communicate the change to you? (You can circle more than one box)
Meeting/newsletter/to you/none/rumour/steering group

7. What is the main role of your department?
....
....

8. Did the last change enhance that role?
Yes/no change/no

9. Could it have been handled more efficiently?
Yes/No

10. If you had been in charge of the change, what would you have done differently?
Yes/No

11. Were you involved in identifying the need for an I.S. change?
Yes/No

12. Were you consulted about whether you thought a change was necessary?
Yes/No

13. Are you ever consulted about whether you thought a change was necessary?
Always/sometimes/never

14. Have you ever been involved in the design of a new is?
    Yes/No

15. Are you ever told why a new information system is being introduced?
    Yes/sometimes/never

16. Did the new I.S. form part of an overall strategy for your department?
    No/don't know/yes

17. Did the new I.S. affect staff morale?
    Much lower/lower/no change/higher/much higher

18. Did any parts of the new I.S. prove dysfunctional to the department/organization?
    All/some/none

19. Do you get adequate feedback from the I.S.?
    Yes/No

20. Do you highlight errors in the I.S.?
    Yes/No

Every information systems development will be different. They will be of different lengths, complexity and scale. However, the above questionnaire should help your organization identify whether the issue of resistance is a problem. It is very important that the level of resistance to change is gauged at an early stage as it can affect the smooth introduction of a new information system. Resistance to change can be overcome if it is handled in the correct way. The following workshop material should also be useful for your organization as it tries to allay any fears your staff may have concerning the information system change process.

Resistance to Change Workshop

One of the reasons IS do not perform as well as expected has nothing directly to do with hardware or software but a lack of understanding of the issues surrounding **resistance.to.change**. It would be straightforward to dismiss resistance to change as being merely the obstinacy of potential users of the system. This would reveal an ignorance of the intricacies of the change process. Many organizations appear to be in a constant state of change. They need to be able to plan and manage change to facilitate a smooth transition and successful outcome. Research has shown, however, that this is very difficult to achieve.

Bringing about a change can be a complex process. It depends on several factors:

- The severity of the change.
- The timescale of the implementation.
- The overall climate or culture.
- The position of the initiators relative to those influenced by the change.
- Whether there has been a previous failed implementation.

Each of the above factors can have a significant effect on whether a particular change process is successful or not. The introduction of IS into organizations can often be the most complex of change situations. This change can often lead to a redefining of power structures, reporting mechanisms, and the control over information itself. It is not surprising that this change process often leads to an increase in anxiety. Very often a successful change is dependent on adequate education and training being provided for those affected by the change. This clearly requires managers, trainers and systems staff to understand the change process and its added complexity in the IS area.

Kotter & Schlessinger (1979) have suggested that resistance to change can be overcome by:

- Education & Communication
- Participation & Involvement
- Facilitation & Support
- Negotiation & Agreement
- Manipulation & Co-operation
- Explicit & Implicit Coercion

A choice of any of the above, or a combination of the approaches may be useful in ensuring a smooth implementation for the new information system. The choice may be dependent on the special circumstances of the change.

Rationale for the Workshop

This workshop should take place well in advance of any system change. It is difficult to give an exact period of time before the introduction of a new IS when the workshop would be most effective.

We have already pointed out that the introduction of an IS into an organization is a complex issue. One way of substantially improving the chances of success of such a change is to view the whole change process as a team effort. Hopefully, this will lead to the smoother implementation of the new system.

Participants

Unlike other workshops, the participants for this particular session should be carefully chosen. The reason for this is that the introduction of the new system will have a special effect on certain groups of staff within the organization. It is important that the interactions between the various groupings are analyzed.

Some smaller system implementations will need the majority of the workshop participants to be drawn from one or two departments. Larger system developments will require participants to be drawn from a wide range of staff groupings. Typically, this includes:

- Users
- Management
- Trainers/Human Resource Management Staff
- Systems Professionals
- Suppliers/Outsourcers.

The Workshop

The first session will involve the specialist practitioners, e.g. the users, in separate groups. There must be one trainer with each group. The trainer will introduce the session, observe the session, and, if necessary, help formulate the group's response to the exercise.

Each group will be presented with the same exercise.

Your organization will start to develop an integrated information system in six months time. The vast majority of staff will be affected by this new system. Your group has to identify what would be the ingredients of an effective IS change?

Select a spokesperson from within each group who will be in a position to report back the findings to the whole group. Allow sufficient time for this exercise. Do not be surprised if you get a high degree of consensus within the individual groups of what they believe would go into an effective system change. One or two groups may have difficulty coming to terms with the overall change concept. You may need to refer them back to a previous change process that they have been involved in. They should be able to remember what was right or wrong with that previous change.

After a short break, the group 'leaders' will present their findings to the whole group. The intervention of the facilitators will be limited at this stage. Once the groups have presented their findings it is important that the differences are highlighted. This should not be done in a negative way. There is a lot of 'rich' learning that can come out of this exercise.

Possible Outcomes

- A realisation that changes have to be planned for.
- The importance of the timing of education and training for the success of a project.
- The need to communicate effectively any system change.
- An understanding of the effect on the organization of any system change.
- The benefits from the new IS should be clearly explained well in advance of it going live.
- Do not raise expectations that cannot be fulfilled.

The following are workshops to try and stimulate discussion about important issues. It is hoped that this approach will improve the learning possibilities within your organization (see Exhibits 5.3, 5.4, and 5.5).

The change brought about by the implementation of new information systems usually affects system users more than any other group within the organization. It is generally accepted that by involving users in the system development process an improved system will result. As already mentioned system development entails users, management, and information services staff working together to produce effective information systems.

Involving staff during the process raises not only their perception of the system, but the system developers as well. It also results in their being more likely to use the system when it is implemented as their knowledge of the system increases and system training becomes more relevant.

They are also able in principle to play an important role in areas such as system design and system testing. A socio-technical approach can yield benefits for the organization. A socio-technical approach is one which recognises the interaction of technology and people and produces work systems which are both technically efficient and have social characteristics which lead to high job satisfaction.

In many instances users are asked to do extra work during the system change process, e.g. when old and new systems run in parallel. It would appear that by involving users in the development process the outcome is more likely to be beneficial to all concerned.

Exhibit 5.3.

<u>Workshop.1</u>.

Your department is about to become networked. The aim is to create a totally integrated information support system. One difference that will be recognised by all the users is that a change in one part of the IS will have an effect in other parts of the organization.

You have been given the role of system facilitator. Your group is expected to compile a report to be given to the Chief Executive outlining those areas where you feel the greatest attention should be taken. This initiative is expected to be the first of many where the vast majority will be involved.

Produce your answer with special reference to:

a The way that communications will be affected.

b The way that education and training may become of strategic importance.

c The shared use of software and hardware (i.e. printers).

<u>Feedback</u>

It is important that the Managing Director appreciates that a totally integrated system is a high-risk high-return strategy. As this is the first major system development it is important that the Managing Director is aware of the consequences of this initiative failing, namely:

- disillusionment with the system
- resistance to future system changes
- low staff morale
- possibly higher staff turnover
- poor relations between users and systems staff
- dysfunctional effects within the organization
- inaccurate information leading to poor decision-making.

With any major system change it is important that it is communicated effectively to all those staff who is involved. This could be facilitated by regular meetings, workshops, newsletters, etc. It is important, however, not to raise expectations with any new system. If a system is going to be 3 months late then everyone should be made aware of this. Users are an integral part of the system and may be the difference between its success or failure.

Education and training are areas of major concern with any system development. A basic training needs analysis should be undertaken at an early stage. Education may be an even more important issue. It is sometimes necessary to 'sell' new information to users/managers. If staff views I.T. as a cost rather than an investment they will have negative views about the new system. The potential benefits of the new system should be pointed out at an early stage. If users feel confident with a new system. they are more likely to use it in an effective way. The technical issues relating to software and hardware should be explained in a sympathetic way. It is just as important to point out the limitations of a new system as it is to point out its strengths.

Exhibit 5.4.

Workshop.2.

You have just been given the post of Project Manager for the introduction of a large enterprise-wide information system for your organization. It is anticipated to 'go live' in exactly three year's time. Your organization has no experience of a totally integrated system. Previously, information requirements have generally been satisfied by a range of software – some of which interfaced across departments.

Previous attempts to actively involve staff in new system developments have proved disappointing. Two years ago the introduction of a new I.S. was so badly handled that staff ended up failing to use the new system and it went into terminal decline.

Your group has been asked to produce a strategy document that will allow you to plan for the introduction of a new system. It is expected that this document will include staff involvement, dates, training schedules, contingency plans, methods of communicating the change, etc.

Feedback

1. The scope and limitations of the new system should be identified.
2. Those staff that will be influenced by the new system should be identified.
3. Staff should be informed of changes to their current working practices.
4. The training and education consequences of the new system should be identified.
5. A meeting of staff involved with the new system should be set up to communicate the project strategy.
6. A project steering group should be set up containing at least one member from every relevant group of staff. Members of the steering group should play an active rather than passive role in the system development.
7. Realistic time schedules should be initiated so that responsibilities during the project life can be clearly given to staff.
8. Training and education should be undertaken to suit the Users and system not to suit the suppliers.
9. It is very rare that a project runs smoothly. Contingency plans should be put in place - often taking a "worst-case" scenario.
10. Produce a plan that allows the system development, and changes to it, to be communicated to all relevant staff. This could take the form of a newsletter.
11. Staff should be made aware of the need to communicate between departments when integrated systems are being developed. Examples should be given outlining the consequences of not identifying problems with the system at an early stage.
12. The time taken for systems development means that there is every chance that the original aims and objectives of the system may change. It is crucial that major changes are identified and steps are taken to make sure the system is effective when it goes 'live'.

N.B. THERE IS NO POINT IN HAVING A SYSTEM IN PLACE THAT WAS RELEVANT 3 YEARS AGO BUT IS IRRELEVANT TODAY!

Exhibit 5.5.

Workshop.3.

The cost-benefit analysis is often used by systems professionals and management to decide whether an IS should be developed or not. In many instances the tangible costs and benefits are easy to identify. The intangible benefits may be reasonably easy to identify but very difficult to quantify. One area that receives scant attention is the possible dysfunctional effects of introducing a new system into an organization.

Your group has been given the task of producing a checklist of organizational and change management 'costs' that are often borne by a department/unit during the implementation of a computerised information system.

e.g. a) Users producing test data
b) Managers releasing staff to undertake project management duties.

Feedback

Checklist of Organizational Change Management Issues

1. Involvement in project management meetings.
2. Visiting sites using similar systems.
3. Training and Education.
4. Interfacing with suppliers.
5. Producing data for system development staff.
6. Interviews with system development staff.
7. Producing test data for the system.
8. Involvement in the changeover process.
9. Identifying & feeding back errors in the system.
10. Evaluation and review of the system.
11. Time taken to 'bed-in' the system.
12. Joint development of an information/information system strategy.
13. Trained staff may be required.
14. Possible increase in staff turnover.
15. Resistance to change.
16. System downtime.

n.b. This is not an exhaustive list but covers a number of important resourcing issues.

It is also important to try and ensure that users, systems staff and management continue to communicate throughout the life of the system. It is possible for a system to be a technical success but still not be used by users and managers. This puts extra pressure on system staff to ensure that the overall change process is handled effectively.

Who should be involved in the system development process? Many writers believe that a participatory approach to system development and information strategy formulation will pay dividends. Even where it is agreed that user involvement is beneficial, however, the degree of this involvement is often undefined.

Historically there have been weak links in the communication between these groups of staff. This could be because the opportunities for involvement during system development can vary dramatically during the lifetime of the project: continual user involvement during the whole change process can, however, pay dividends for the organization.

One of the extra roles of the system developer might be that of **conflict-resolver**. A significant proportion of the conflict that can arise within the system development process is due to alienation of users because they do not believe that they have been consulted during the change. However, it is a two-way process and users should try to help (as well as enable) system developers understand their roles within the change process.

Writers have identified the problems of viewing the design and development of systems as being purely technical issues. Information systems are used by employees with each individual having different expectations from the system. They will have different uses for the information that the system may provide. Different departments may use the same system in different ways. The same information system may be received differently by two separate organizations.

It is important that users perceive themselves as being stakeholders during system development. Involvement, in general, increases self-esteem. It also leads to more favourable attitudes towards the new system. It is important to communicate any future changes to users so that they are prepared when the system finally goes live. Otherwise they may perceive that the system was not theirs but owned by 'management'. It is very difficult to change these perceptions once they have been instilled within the users. It may be possible to give roles to users during system development. They may then become part of the system and this may reinforce the change. Replace the volumes of recommendations with working sessions attended by the people who will be charged with taking the action, to decide what to do, who will do it and by when.

One way of ensuring that commitment from users is forthcoming is to prove to them at an early stage that there will be real benefits from the new system. This could be through improved working practices or more accurate information. These examples are usually given to justify the investment in a new system. However, if the new system leads to an increased workload and inaccurate information any commitment would soon wane. The information system should be a means to an end for the users. Information systems need to be considered not just as artefacts but from the perspective of the people who may wish to use those artefacts to support their activities and decisions in a more informed manner.

There are, however, a number of reasons why users may not be able to play an active role in a particular system development. Users are not always in a position to explain what they require from a new system. They may not be able to put into words understood by the system developer what it is they actually do and why they do it. If this information is not forthcoming it could have a detrimental effect on the design of the new system.

Users cannot always actively participate in the change brought about by system development - they may be unable to understand the technical aspects of the system development process (i.e. data flow diagrams). It is just as important that the development process is user-friendly as the system itself. Increased interaction between users and system developers should increase the likelihood that systems can react to changing requirements and deliver real benefits to users.

User satisfaction is an important area that must be addressed at a time when management is questioning whether an adequate return is achieved from their investment in information technology. If users are unhappy with implemented systems they are unlikely to use them for their decision-making. System developers should be aware of what they can incorporate into the design of systems that will ensure their maximum, effective use:

Among organizational behaviour issues, user satisfaction is considered a crucial factor affecting IS effectiveness and success. Consequently, the measurement of user satisfaction as a major indicator of IS effectiveness is frequently discussed throughout the literature. It is surprising that many system developers do not appreciate the importance of involving users in order to ensure a successful implementation. In many instances it is important that developers 'sell' their systems to users. Users need to see tangible improvements from the systems that have been developed.

There are few documented examples of organizations providing an adequate level of resources for systems education and training when systems are being developed. System training has often been either at the wrong level, given to the wrong people, given by the wrong people, or given at the wrong time (Karuppan & Karuppan, 2008). Sometimes no training is given at all. If, however this is handled effectively it can help to cement the whole change process.

Many organizations find it very difficult to transmit the message of what the training and education is attempting to change, and there are problems stemming from the different levels of training required, and its pace. There are also major discrepancies in the area of whose responsibility it is for the training. The system supplier may provide a limited amount of training on the actual system. However, it is necessary to inform staff of the changes the technology will make to the way they do their jobs. It is rare for organizations to learn from the mistakes they make in the area of education and training.

When organizations are implementing computerised information systems for the first time there is understandably a high level of anxiety when these systems are implemented. Generally speaking staff that have no idea what changes will occur once the new system has been introduced. Training in these situations has to be handled in a sympathetic way. Training needs analyses are required at an individual rather than a departmental level. It is universally accepted that information technologists use much jargon. This can produce another barrier between the learner and the trainer.

Training of information services and **training staff** is also crucial if cascade training is going to be employed, in which someone having been trained trains others. In some situations companies may turn to highly capable 'super users' to facilitate the overall training process (Karuppan & Karuppan, 2008). Recent experience has shown that service quality will be measured not only by the moments of truth with the user or customer but by how IS leaders respond to the needs of their individual contributors within IS.

Organizations with limited resources are more likely to employ cascade training as a way of training their staff. However, this process has to be handled very carefully. If bad practice is picked up at an early stage of this process then this can be transmitted down the line and it may become prevalent in the wider system. Very often this way of training staff is measured in number of hours and not in quality or level of competence achieved. It could be stated that successful use of information systems is 90% about people and only about 10% about technology.

Few organizations foster a **'learning environment'** where training and education are part of company culture. Many managers and system developers see training and education as a cost rather than an investment. It is important that staff are able to gain access to education and training that will help them respond to major changes within their organizations. Staff will not be enthusiastic about the training for the new system if they think it is not going to be an improvement on the previous situation.

It is important that the information systems department is seen as a key part of the organization and one way of doing this is to raise the profile of systems education and training within the organization. Systems education and training may raise awareness of how information technology can be viewed as a strategic area within the organization.

It is important that consultants, information systems staff, and suppliers nurture the relationship with these users as they will be very vocal if the system does not meet their expectations. Conversely, if it is effective they will act as ambassadors for the new system. It must be remembered that during system development users will be doing their own jobs and even training may have a disruptive effect on their present jobs. Training must be provided that takes account of the fact that users are going through what may be a traumatic change process.

A key part of any system development is the need to plan for the change. A major part of the **implementation.process** is ensuring that staff who have been adequately trained for the new system. There is a common assumption that because training has been given, it has also been understood. This is a serious misapprehension.

FUTURE TRENDS AND CONCLUSION

It is interesting to note that in a recent survey of ICT managers their major concern was identified as managing change (Computer Weekly, August 2007). This is interesting because it has taken nearly 40 years to identify that organizational and behavioural issues are just as critical as technological issues to the success of ICT projects.

A number of important issues have to be addressed before ICT change takes place within organizations. These are practical rather than theoretical issues – and that is why this chapter has included a number of useful examples. In future, ICT methodologies should view change management as a crucial issue that must be addressed before information systems are implemented. The authors have been aware of this important area of concern for a number of years (Brooke & Maguire 1995, Brooke & Maguire 1998, Maguire 1998, Maguire, 2000).

Resistance to change can make an ICT project less effective than it could be when all staff is supportive of the new system. It is important that this is measured in advance so that any problems can be alleviated. This may be achieved by putting more resources into training and educating staff. As in other areas of business it is important to plan for change.

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Section II
Techniques for Effective ICT Development

Chapter VI
Identifying Opportunities for Using ICT

Organizations that fuse technology, business process design and business relationships are expected to outperform those that do not by at least 15% per year, but only if they have a high level of credibility and the necessary skills (Gartner symposium, Barcelona, 2005).

The Eden Project in Cornwall has launched what is believed to be the U.K. first paperless ticketing system based on mobile phone technology. Visitors to the garden park will be able to order, purchase and redeem their tickets using their mobile phones (2007).

INTRODUCTION

The reason for going ahead with a new information system (IS) development can come from many sources. A new business requirement may force an organization to develop a new IS. An existing IS may be coming to the end of its usefulness. The firm may decide to either update its existing system or develop a completely new system.

Exhibit 6.1.

Mini Case: L'Oreal's ICT Strategy

In 2007, L'Oreal developed software to help its account manager's work with major retail chains to forecast and improve sales of its products. The global cosmetics firm has developed an application based on Cognos planning software that uses sales data from the company's core SAP (enterprise resource planning) database. The system enables retailer-specific sales forecasts to be produced much faster than the previous system, which was based on Excel spreadsheets. Each week, sales information from retailers' electronic point of sale systems is uploaded into the cosmetic firm's SAP data warehouse. It is then transferred into Cognos. The tool enables L'Oreal's national account managers to run planning and forecasting models that project unit sales and profit margins on L'Oreal products in retailers including Asda, Boots, Tesco, and Morrisons.

An organization may review its existing systems and discover that an existing system is not providing the up to date information that is required by the organization. Users within the organization may have new decisions to make and that may prompt the firm to implement a new IS. The organization may find itself under increased competition. It may feel that it has to develop a new IS to keep up with rival companies. Smaller firms have a similar range of problems but are not even able to call on experienced information systems (IS) staff to tailor their software and usually have to rely on off-the-shelf packages (Maguire et al 2007).

A new technology may become available that puts pressure on the organization to update its existing technology platform. It is important that the organization does not rush into an information system development without careful planning. Too many organizations have implemented IS without considering the repercussions. This is an important issue even for small and medium-sized enterprises (Maguire & Magrys, 2001). Larger firms can spend billions of pounds (sterling) on new information systems. It is likely to be the biggest capital expenditure they undertake. They do this even though the measures for performance evaluation are rather underdeveloped (Tallon & Kraemer, 2007).

Is the quest for strategic business advantage through ICT no more than the emperor's clothes? While the tailors assure us it is not, a growing body of research suggests that this may be the case. Equally worrying, some researchers say managers are finding it increasingly difficult to believe technology alone is a contributor to sustainable competitive advantage (Irani et al. 1999), These findings are echoed in a working paper from City University Business School which says that while users endorse the need for competitive advantage from their ICT systems they rarely adopt criteria to enable them to assess any advantages systems confer. A similar finding came from the Massachusetts Institute of Technology (MIT) research programme into the effects of ICT in the 1990s (Scott Morton, 1991). It found that information systems (IS) are easily copied by competitors and that changes in company structure rarely bring lasting benefits. One would imagine that over 15 years later we would have learned from previous mistakes.

At the same time writers are struggling to find excellent examples of highly successful ARE/ICT implementations which have made a dramatic difference to commercial organizations; systems installed at such organizations as Thomson Holidays, Dun & Bradstreet, and American Airlines (Turban et al 2004b).

The picture uncovered by these studies is one of a broad mass of users failing to secure significant commercial benefits through ICT investment and in many cases not even taking steps to determine whether such benefits have been gained, while continuing to pay lip service to the idea of competitive advantage. If these researchers are correct, and there is no reason to dispute the findings, IS departments must find some other basis for initiating further investment. At the very least, they must adopt some objective criteria for demonstrating that competitive advantage is capable of being secured by such investment (Chaffey and Wood, 2005).

.Additionally, it has been noted that the opportunity to apply Internet technology exists all along the company and industry value chain systems, offering considerable potential for improving operating efficiency, reconfiguring value chains, and lowering cost. The study also suggested that various **e-procurement** software packages reveal that the purchasing processes can be streamlined to eliminate or reduce considerable manual handling of data and by substituting this with electronic communication, e.g. **e-quotation**, **e-purchase.orders**, **e-acceptance** and **e-shipping.notices**. However, these are largely underpinned by intranets and extranets as part of an overall ICT package.

In contrast, inappropriate use of the internet could result in business failures, e.g. selling inferior products over the net. If one customer has a bad experience, they may inform a network of friends who then boycott the site. This could be especially problematical for small firms that traditionally have cash-flow problems. . With the global efficiency of the internet, this news can easily spread on a larger scale. Hence, on-line businesses need a better understanding of appropriate organizational strategy formulation processes in order to sustain their competitive advantage (Turban et al. 2004).

As we have already seen information is a very important resource for the organization. Better information should lead directly to better decision-making. However, ensuring a steady stream of accurate information in a dynamic business environment is very difficult to achieve. One example might be where consumer preferences are changing regularly. In other words your organization could go to

Exhibit 6.2.

Mini Case: Dutch airline KLM

Dutch airline KLM is using a recently established competency centre for business intelligence to enable the roll-out of a company-wide ticketing system with business intelligence capabilities. From March, 2007 the airline began rolling out the ticketing system from Amadeus. Key to the project will be the effective creation of new interfaces between Amadeus and its business intelligence system from SAS. The manager of KLM's business intelligence competence centre said the airline's decision to centralise its application development was crucial in order for it to tackle the booking system upgrade. This involved a 30 year-old platform being replaced by the business intelligence-ready Amadeus system

a lot of time and expense to develop a database or data warehouse containing billions of items of data on customer requirements only to find that six months later the information is largely useless.

Increasing numbers of organizations are realising that the really useful data and information is outside the organization in the business environment. Increasing numbers of organizations are turning to **customer.relationship.management** (CRM) systems**.(**Bocij et al 2004) to try and increase their market share. However, these systems can only work for the firm when they capture extremely accurate, up to date information.

Capturing inaccurate data is also problematic for the firm because they can waste resources by sending business details to the wrong address. It has also been known for many firms to keep sending company literature to previous customers who are now deceased! This is obviously catastrophic for all those concerned.

At the very least companies should ensure that they can manage information within their own organizational boundaries. It would be a disaster if two or three different departments had different databases because they were trying to make corporate decisions with erroneous data. It is hope that enterprise wide systems will overcome most of those problems.

ENVIRONMENTAL SCANNING

However, imagine if you were working in the financial markets and you were trying to clinch multi-million dollar deals with inaccurate information! You would definitely only rely on 'real-time' information. You may make a transaction on a particular share price. Obviously if that price is wrong it could be catastrophic for everyone concerned. Similarly there are indicators that are crucial in this area such as interest rates and economic indicators. However, some traders in this area may use a mixture of known data and previous experience to make a decision. This is where the decision-making process becomes complicated. Will that share go up or down in value? A company database may not help you with that decision.

It is becoming more and more necessary for firms to have an accurate picture of the business environment in which they work (Mendelow, 1982). As we already know most organizations are doing business in a global economy and it may be that the winners in this very competitive business environment will be those that can develop the most accurate sources of data and information.

We could argue that successful firms will be those that are able to glean the best intelligence from the market place. The following sections will concentrate on what we view as being two of the most important areas, **environmental.scanning** and data accuracy. Remember, if the business environment keeps changing then you may have to keep reassessing the validity of your organization's information systems. This may be an issue surrounding the original system design.

In many cases information systems are developed for a particular time and situation. At times of stability this may suffice for a lot of firms. However, in dynamic and competitive business environments it may be necessary for organizations to constantly monitor their systems for accuracy and usefulness.

INFORMATION QUALITY WORKSHOP

Background

The issue of **information.quality** is one that should be of major importance to the whole of the organization. A number of important questions should be asked:

1 Do you have clearly defined policies for the use and maintenance of information?
2 Do you have procedures in place for the collecting, assessing and updating of data?

In many instances it is data from manual systems that needs to be monitored. You need to eliminate or minimise inaccurate, inconsistent or redundant data. The introduction of an on-going quality audit can pay dividends. Staff may not have developed specific information systems but they can be assigned responsibility for ensuring that certain systems conform to well define data/information quality standards.

If care is not taken over the maintenance of information systems, they will deteriorate.

Most staff can identify a situation where an existing system is not as useful as when it was first implemented. In many instances the output from a system has declined so dramatically that staff who have little confidence in it whatsoever. In many cases this is a gradual decline over a number of years. Even if one accepts the inevitability of this happening, staff should try and ensure that this deterioration process is kept to a minimum.

If staff have little confidence in an IS system they will not put much effort into ensuring that it remains at a particular level of accuracy. This may manifest itself in a number of ways. Amendments to erroneous data may not be processed as carefully, especially if staff feels alienated towards a system. In some cases they will even stop using a system - possibly returning to a previous system. This could well be a manual system of which they feel confident. A lack of confidence is one particular system can have serious knock-on effects. It may lead staff to lose confidence in all systems used in that organization/department. When new information systems are about to be developed, staff may be so disillusioned from previous experiences that they stay aloof from the process itself. Recent research has identified that previous work regarding system usage in organizations may have been too simplistic, focusing on the individual, group, or organizational level (Burton-Jones & Gallivan, 2007).

The Workshop

The first part of the workshop will be to raise awareness of the importance of information quality. Information quality is in fact an organization-wide problem - the responsibility of everyone. All participants should fill in the information **input.workbook.checklist**. The only other information the facilitators need is the department in which the participant is presently working. The results can be analysed by the facilitators during the course of the morning to highlight any specific issues that could be raised later in the workshop.

Arrange the participants into departmental groups for the first exercise. There will need to be one facilitator per group. The first exercise is to get the group to rank the IS they use in order of importance when meeting the goals and objectives of their particular department. It is expected that even within departments there will be a healthy debate with people having different views.

** An interesting side issue will be how the perceptions of the importance of the departmental systems fit into the system needs of the wider organization.

The second session should take place within the same groups. Each of the systems identified in the previous exercise should be analysed to reveal two important issues:

1 How accurate is the data that is input into the system?

2 How accurate is the output from the system (hopefully information)?

** It is important that the participants feel able to give an honest assessment of what they perceive to be the quality of the information systems that they use.

Each group should have a member in a position to report back to the larger group. The larger group should meet after a short break. Each group leader should give an account of the group's findings with the facilitators noting specific issues of importance.

The whole session will get participants talking about an area that most will have thought was outside their sphere of influence. It will also allow that participants to critically evaluate the information systems that are currently being used within their department and also within the wider organization. This should also lead to the identification of systems that should be updated or even changed completely because they are not effective at the present time.

The facilitators should feed back any specific issues to the wider group. The participants should be given the results of the analysis of the information input workbook checklist.

Session three will consist of small group sessions. The facilitators should ensure that the groups consist of members from several different departments.

Within the small group the participants should identify the various ways that they can ensure the quality of information that is either being produced or used by their departments. It is important for the facilitators to try and promote a team approach to solving this particular issue.

The facilitators should, however, try and allow the users to identify the procedures they feel can put in place to ensure that the quality of information and decision-making improved within the organization. There is every chance that a number of useful and varied ideas will be suggested. Sufficient time should be allowed for this particular session. The larger group should meet back without a break so that the issues are still prominent in everyone's mind.

Within the larger group each smaller group should report back their findings. The facilitators should be able to gather a wealth of procedures and suggestions. The users will also feel more ownership for the findings of this particular workshop.

You are not imposing procedures on the users but you are picking up on their own ideas which they feel will be appropriate within their own local situation.

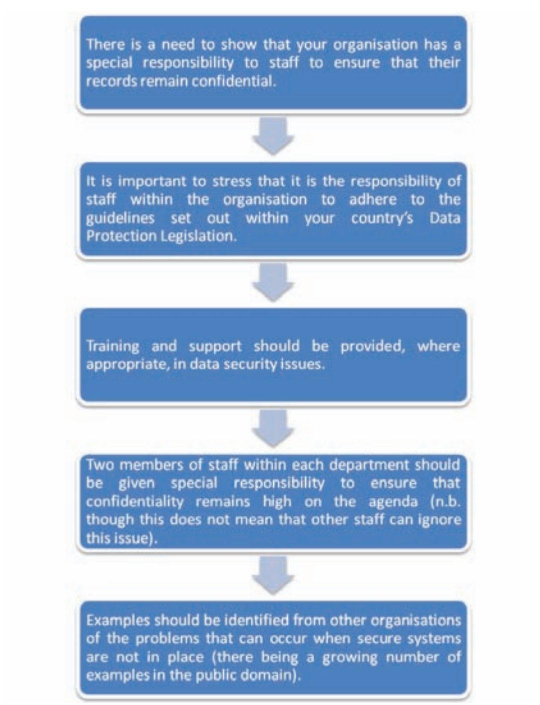
This team approach should pay dividends when the participants return to their own departments. It would also be very useful to raise awareness of the importance

Exhibit 6.3.

<u>Mini Case: A Scenario</u>

You have recently been promoted within your organization. You have moved from a department using predominantly manual systems and data to one that is almost totally computerised and using confidential, personal data. You realise the importance of ensuring that personal data remains confidential. As security has not been given a high priority in the past there are very few procedures in place to combat security/confidentiality leaks. Working within a group, what methods would you use to try and impress upon your staff the importance of secure systems within your department?

Figure 6.1. Feedback flowchart



of implementing departmental information audits - not as a one-off exercise but as a continuous process. It would be very useful if each department could either give this auditing role to a member of staff or a small team. This team could then report back to the other members of ; ; the department on the progress that had been made. A follow-up workshop could also be undertaken to monitor organizational progress and to ensure that this issue remains high profile.

IDENTIFYING OPPORTUNITIES

There are a number of approaches that an organization can employ before developing new information systems. Do not put in the technology and then start thinking about changing your business processes or information requirements!

Strategic Questions

1. How can we evaluate the business benefits of proposed investments?
2. Which decision criteria are most appropriate to set priorities between competing projects?
3. What is the contribution of our investments to improving the corporate strategy and business leverage?
4. How can we manage the decision-making process that underpins our investment appraisal?
5. How can we create commitment to a decision and establish a shared mindset?
6. How can we monitor the progress and performance of investments, in order to identify improvement actions?
7. How can we get evidence of adequate returns on the funds invested?

Improved communication and collaboration between:

- Individual employees, e.g. for electronic mail, task & meeting scheduling, group decision support or videoconferencing.
- Functional departments & business units, e.g. for just-in-time manufacturing, identifying cross-selling options or standardising the customer interface.
- Partners in the business chain, e.g. for telemarketing and teleshopping of customers, shared business intelligence systems or integral supply chain management.

Other improvement opportunities include:

- The rigidity and often long throughput time of these kinds of planning exercises. The basic premise of traditional strategic planning methodologies is a corporation-wide, top-down prioritisation of all it applications that are deemed necessary. However, business reality is often much more dynamic than the planning structure embedded in these methods.
- The relatively reactive nature of these methods, with consequently little attention to innovative, groundbreaking it exploitation.
- The exclusive attention to it in administrative, supporting processes. Traditional planning methodologies pay little attention to it primary processes and in the products and services of modern organizations.
- The focus of data and application architectures within autonomous organizations with central data storage and information processing. As argued before, it-based infrastructure planning should cover a broader range of issues and take into account the existence of relatively autonomous parts of an organization.
- The lack of sufficient aids for evaluating investment proposals in order to justify the allocation of limited funds.
- Preventing misallocation of financial resources.
- Improving business performance.
- Creating a shared investment vision and capturing learning opportunities.
- Profitable exploitation of it-based infrastructure.

Exhibit 6.4.

Mini Case: P&O Ferries

In 2007 Freight ferry operator P& O. Ferrymasters upgraded its accounting system and moved it on to Windows to lower the cost of ownership and offer business managers more up-to-date information. The company, which operates in 22 countries, is moving to a web-based system running Windows 2003 Datacentre, as part of a £400,000 project. As well as reducing support costs, the move onto a new platform allows more frequent and flexible financial reports. The company can react more rapidly to changes in demand by adjusting pricing, discounts and capacity. While moving to the new platform, P&O. Ferrymasters took the opportunity to standardise its accounting procedures.

INVESTMENT EVALUATION: Why is it Complex?

Most of the benefits could be intangible and these are by their very nature difficult to measure. The reasons are:

- Benefits are difficult to assess measure and manage.
- Costs are high and difficult to predict.
- Large uncertainties and major risks.
- Communication problems and stakeholder politics.

FUTURE TRENDS AND CONCLUSION

A major change has taken place in the last 10 years as organizations are predominantly using ICT to make links outside their own company's boundaries. To improve their effectiveness firms are engaging with customers and suppliers to improve their business processes.

However, the majority of these firms know that their competitors are engaged in similar activities. Firms are under increasing pressure to monitor their dynamic business environments. Collecting raw data from the environment is only the first stage of a series of complex activities. The individual firms must have staff with a range of expertise and competences to turn this raw material into a quality, finished product – information or intelligence for effective decision-making.

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Chapter VII
Introduction to Current Techniques for Effective ICT Development

Implementing Lean software development can lead to productivity gains of between 20% and 40% and that quality and speed of execution can improve markedly within a matter of months. Both valuable benefits when the cost of developing and maintaining applications now account for about 50% of the average I.T. budget – a figure that is set to rise in the future (McKinsey report dubbed "Applying Lean to Application Development and Maintenance 2007).

Until recently, many firms had bought business intelligence systems at a departmental level, resulting in myriad different tools being used across the business. Firms are now looking across the business to ensure a consistent, standardized approach to analyzing and measuring data which should also boost operational efficiency (Computer Weekly 2007).

INTRODUCTION

The development of information systems (IS) has for many years been regarded as the domain of the technical expert. In what appears to be a growing number of instances systems appear to be having negative effects on the organization. A regular spate of system failures may have identified serious flaws in the system development process. Organizations may often be significantly affected by the implementation of IS. Future IS development may increasingly be trans-organizational and therefore increase the potential for dysfunctionality. Even changing one line of code may have repercussions within a department/organization. To implement a totally integrated system within an organization without adequate preparation could have serious consequences for the financial well-being of the company.

The development of information systems is a complex process, one with many opportunities for things to go wrong. To try and control this complex process a methodology was required that would bring more discipline to the IS development process. There is a need to make more efficient use of the resources that are available. Historically, IS has been developed using the **system.development.life.cycle. (SDLC)**. This has been the prevailing methodology for medium and large system projects. However, the use of accepted methodologies for IS development have not guaranteed the successful implementation of information systems.

The information systems (IS) discipline has borrowed a number of techniques from other disciplines. However, many of these have been taken from areas where the outcome from projects is more certain. Virtually all projects are liable to have changing requirements. In IS there are many variables that need to be considered before, during, and after a project has been completed. It is one thing to identify what those variables are and another to react to the changing circumstances.

The question IS must address is whether it is inevitable that projects of a certain size and length will fail to deliver expected benefits. In essence IS is trying to hit a moving target. The 'contract' (**user.requirements**) for a new information system is agreed at a comparatively early stage. All parties agree on requirements and the project development team retreats to build the system. This can be a lengthy process.

For a change in the system development process to take place participants must agree that the current methodologies are not working. This in itself is problematical. System developers are generally happier with a fixed set of requirements. What incentives are there for the various stakeholders to change the way system projects are currently handled?

The methodologies that support this process tend to provide more emphasis on control at the expense of planning. They would be more appropriate in static business environments. Even in this situation there will be project failures. The initial premise for an IS project should be that *there will be change.* The methodologies should then provide enough flexibility to allow for the forthcoming changes. Ideally a vision of the implemented system should be formulated at an early stage.

In many instances the full implications of change are not appreciated. If an information system is implemented in one area of the organization there are often knock-on effects elsewhere. Inevitably data and information often cut across departmental and functional boundaries. However, from the system developer's perspective it is simpler to draw a tight boundary around the system. This may manifest itself through a narrow focus being taken i.e. only a small number of potential Users may be interviewed about the previous system and the possible effects of the new system.

With totally integrated information systems the problems of poor design will be much greater than if the individual systems were decoupled. It requires an individual or group of individuals to identify the possible consequences of errors in the system. It could be argued that the system developer should be able to identify the repercussions of introducing new systems into organizations. However, it may be in that person's interest to simplify the whole process and ignore any dynamic analysis of the holistic change that may take place. The IS development team may not see this as their responsibility so that when implementations are reviewed the issues of change and externalities are rarely mentioned.

One certainty of the IS development process appears to be that change will take place when the system is installed. From changing one line of code to implementing an **inter-organizational information system change** will occur. It is only the scale of change that will be different. This chapter will borrow from a number of other disciplines to try and make sense of a complex area. Are there techniques in the business world that have not been fully adopted? i.e. environmental scanning.

Several areas can be explored to try and improve the effective development of information systems (IS), i.e. why do information systems fail to deliver expected benefits? A series of concepts are then identified in relation to IS development focusing on the user requirements process. From these a number of issues surrounding the system development process will be isolated, i.e. the time taken to develop information systems.

A lot of development has been undertaken to highlight these IS development problems. A number of authors highlighted why effective design is so important in the information systems development process. Other writers have put forward novel ways of designing information systems so as to build in flexibility while other research has concentrated on the close links between information systems and organizational change. The need to try and analyse any changes that may have an impact on the implemented IS has been another useful addition to the debate. The important requirement of planning strategically for IS has also been highlighted.

Research has shown, however, that organizations implementing information systems find it very difficult to draw the correct boundary around the system they are considering and they are often found wanting when the environment in which the system is being developed changes. This has had a major effect on the success, or otherwise, of information system implementations. Over 35 years ago

Dearden (1972) suggested that because companies were changing so rapidly it was difficult for their information systems to keep pace. This was blamed on the inability of information systems staff to react to change. Those staff that is perfectly adequate in a static situation may become ineffective in a dynamic environment. He questioned whether the new information technology could handle the complex requirements of management.

To counteract the inertia induced by stabilizing processes, organizations require information systems that enable them to adapt and tune into changing environments (Hedberg & Jonsson 1981, Robb, 1997). A number of writers identified that taking a narrow focus on the system design process can ultimately lead to system failure (Klein & Lyytinen, 1985, Brooke & Maguire, 1998). The development of new systems can be an expensive exercise for organizations. The organization and its environment do not remain static while a new IS is developed. The process also uses valuable resources. This opportunity cost may be a high risk to the organization. It is argued that if projects can be identified as high risk in advance firms can develop strategies to counteract these factors (McFarlan, 1981).

This may entail the development of risk management methodologies to underpin the IS development process. **Risk.management** in this context is the ability to anticipate what might go wrong in an IS project (Hoffer, George, & Valacich,

Exhibit 7.1.

Mini Case: Risk Management

Risk management has traditionally been considered the concern of the finance department, but regulatory requirements and an increasing number of risk-based standards are pushing I.T. directors to consider the issue as well. Even though most large firms have had registries dealing with financial risk for some time, many are starting to realise that potential information security risks should also be included, not least because external auditors are increasingly requiring it. Organizations are also beginning to find that more of their customers are demanding a risk-based approach to security. For example, public sector organizations have to comply with the ISO 27001 standard for information security management, and so are demanding that their suppliers do the same. Under the BS 25999 business continuity and disaster recovery planning code of practice, which is scheduled to become an ISO standard in autumn, 2007, organizations are required to undertake both a risk and business-impact analysis. Awareness of this issue is only likely to rise when the ISO 31000 risk management standard is released in December, 2008.

Exhibit 7.2.

Mini Case: Computer Simulation

More than 1,850 U.S. financial institutions have signed up to simulate the effects of an influenza pandemic on financial services. The computer-based simulation ran from 24th September to 12th October, 2007. The simulation was sponsored by the United States Department of the Treasury and the Securities Industry and Financial Markets association. It was organised by the Financial Banking Information Infrastructure Committee and the Financial Services Sector Coordinating Council. The simulation aims to enhance the understanding of systemic risks to the sector. It will offer banks and telecoms providers a chance to test their business continuity plans, and it will examine the effect of an influenza pandemic on other critical infrastructures, such as telecoms networks.

2005). Other writers see this risk assessment as being an integral part of the strategic information systems planning process (Remenyi, 1991). This can include an assessment of the risk associated with project size as well as the risk of system failure – the damage done to the organization if the project fails.

Many systems projects would be successful if the environment for which they had been developed had not changed over time. Most organizations are finding themselves in competitive, changing environments. This situation is often accentuated when the organization is unable to react quickly to changes in the environment. Many organizations have been operating in ever increasingly turbulent environment over the last twenty years. Change is no longer the exception but the rule. Changing organizational structures and staff groupings have led to the requirement for greater rather than less flexibility. This has made the concept of environmental scanning even more important today. This means that more information from the environment should be collected for the business planning process (Mendelow, 1971). This information flow should be incorporated into the information system development process.

It could be argued that the only way an organization can develop information systems that remain effective in turbulent environments is to make them as flexible as possible. However, when specifications are agreed between purchaser (Management, users, etc.) and supplier (IS staff, outside consultants, etc.) and the system is not scheduled to go live for several years it is very difficult to change these agreements without financial penalties being imposed. Even when the organization has a clear understanding of what system is required and works closely with the suppliers of the system during its development; this will be no guarantee of its success (Murthy, 1994).

If a boundary is drawn too narrowly around a system problem there are possibilities that important issues may not be addressed. In an ideal situation an organization should be able to monitor the progress of a system during its development so that any major design problems can be identified at an early stage. In normal circumstances it would be expected that those nearest to the project should be able to identify any problems at an early stage. However, members of the project team may have a vested interest in ensuring that the project is completed. This is a very good reason for involving users at every stage of the project development. They are the staff who will use the system once it goes live and should be able to identify potential problems (Hedberg & Jonsson, 1981). A major problem, however, is that a 'contract' had been signed for the delivery of an agreed system. It can only be hoped that flexibility can be built into the system during its specification.

The longer the length of a particular system development the more likely it is that the original specification will fail to meet the needs of the organization when the system goes live. The project team should monitor the environment to ensure that the system, when implemented, is relevant to the organization's changing circumstances (King, Dutta & Rodriguez, 1978), There is a need to build in early warning systems during the IS development process (Robb, 1993).

A major problem for organizations, however, is to decide which environmental changes will have a significant impact on the system development. Those organizations working in turbulent environments may find it very difficult to monitor the environment so that all the changes that will affect them in the future can be assimilated (Ewusi-Mensah, 1981).

In theory organizations that can predict potential changes in the environment will be able to be proactive in the development of new information systems to take advantage of these changes. It is not enough, however, to be aware of changes in information and communications technology. There is a requirement to be aware of potential 'business-winning' opportunities. The best person to identify ways of reaping the benefits from changes in the environment may not be a senior manager but a departmental head or Senior User.

One very good reason for updating the business, information and ICT strategies on a regular basis is that it may highlight not only changes in the environment, but possible business opportunities. Most companies can benefit from continuously re-evaluating the environment and how their organization interacts with it. This is especially true *during* the system development process where there is a requirement for extra flexibility and adaptability to change.

With totally integrated systems extra reliance is put on their successful operation. If they do not reflect the information requirements of the organization the situation can arise where the output from the system does not match reality. The system continues to be used by staff even when it is apparent that its output is incorrect. This is obviously a dangerous situation for the organization. Normally, the situation deteriorates and the output from the system is gradually ignored by staff. It is often impossible to break out of this downward spiral. A brave decision has to be made that the system is having a negative effect on the organization and should be replaced.

An organization may have to take a brave decision in relation to how it decides to develop its information systems. It may decide to take an incremental approach and introduce rapid applications development (RAD) – a combination of several technologies, including prototyping, joint applications development and software tools to expedite the system development process (Boddy et al 2002).

Rapid Application Development (RAD)

4 main phases:

- **Requirements planning**: The role of joint requirements planning (JRP) is to establish high-level management and strategic objectives for the organization.
- **Applications development**: Joint applications development (JAD) follows JRP and involves users in participation in the workshop.
- **Systems construction**: The design specifications output by JAD are used to develop detailed designs and generate code.
- **Cutover**: Users are trained and the system is tested comprehensively.

RAD assumes:

- Businesses face continuous change and uncertainty.
- Information requirements and information systems must change to meet this challenge.
- Information systems development should be driven by business requirements.
- It is important that information systems are developed quickly.
- **Prototyping** is necessary to ensure quick responses.
- Users should participate in development
- The ‘final system’ does not exist.

For the last 40 years in the software industry there has been a major problem with what is known as the Applications Backlog. There is always more demand for information systems than the resources to supply them. Just as Rapid Applications Development has tried to address some of the key issues it is believed that we can learn lessons from Lean Philosophy. The following section identifies some opportunities to improve what was often believed to be an intractable situation.

Lean Software Development

It is claimed implementing the ‘lean’ approach can lead to productivity gains of 20%-40%. Quality & speed of execution can improve markedly within months. Currently, developing & maintaining applications now accounts for 50% of the I.T. budget. The concept was originally developed by Henry Ford in the 1920s as a means of preventing overproduction, while at the same time improving response times to changing customer needs. Lean and traditional waterfall methods of development come from very different philosophical places - and organizations are likely to encounter difficulties if they try to combine the two. Benefits arise when bottlenecks are eliminated in underlying development processes and tightening up the feedback cycle. It also believed that lean thinking can be applied to ICT management by adding value to information enabling it to flow to the end-user (customer) through the processes of exchange, sharing and collaboration (Hicks, 2007).

The Waterfall Development

The Waterfall development model is a sequential approach in which development is seen as flowing steadily downwards through the phases of requirements analysis as shown in Figure 7.1

Agile Software Development

- Agile s/w development is a conceptual framework that embraces and promises evolutionary change throughout the entire lifecycle of a project.
- Most agile s/w development methods attempt to minimize risk by developing s/w in short time-boxes, called iterations, which typically last from 1 to 4 weeks.
- Each of the iteration is like a miniature s/w project of its own, and includes all of the tasks necessary to release new functionality; planning, requirements analysis, design, coding, testing, and documentation.

Figure 7.1. Phases of requirement analysis

Lean Software Development (7 Principles)

7 principles behind lean development were laid out by Poppendiecks (2003). The principles are: eliminate waste; amplify learning; decide as late as possible; deliver as fast as possible; empower the team; build integrity in; & to see the whole.

- **Eliminate waste**: Everything not adding value to the User is considered to be waste, i.e. additional code and functionalities, delay in the s/w development process, unclear requirements, bureaucracy & slow internal communication.
- **Amplify learning**: The learning process is sped up using short iteration cycles. Increasing feedback and having short feedback sessions with the user help to realize the current phase of the development & adjust efforts for future improvements.
- **Decide as late as possible**: By delaying decisions as much as possible, they can be made based on facts and not uncertain future predictions. The more complex a system is the more capacity for change should be built into it.
- **Deliver as fast as possible**: The sooner the end product is delivered; the sooner feedback can be received and incorporated into the next iteration. The shorter the iterations, the better the learning & communications within the team.
- **Empower the team:** Managers are taught how to listen to the developers, so they can better explain what actions might be taken, as well as provide suggestions for improvements.

- **Build integrity in**: Conceptual integrity means that separate components work well together as a whole, with balance between flexibility, maintainability, efficiency, and responsiveness. The information flow should be constant in both directions – from User to developers and back.
- **See the whole:** Defects in s/w tend to accumulate during the development process. By breaking down the big tasks into smaller tasks and standardizing different stages of development, the root causes of defects can be found and eliminated.

Undertaking Information Requirement Analysis and Process Mapping

Information Requirements Analysis should allow your organization to have a much clearer picture of what gaps it has in terms of information provision. If the process is carried out in a systematic way a major outcome should be a much better coverage for your firm in terms of providing valid information for your decision makers.

The best way to learn about this approach is to do it yourself. Choose an area of your organization where data is being processed. In essence you could regard information requirements analysis as an operational equivalent of business process re-engineering.

You may decide to choose a system such as sales order processing. Any organization that sells a product or service will have a similar system. Data input into this system will enter other systems within the organization. This will probably necessitate crossing departmental boundaries. Sales order processing is dependent on sales invoicing; which feeds data into sales ledger, sales analysis, purchase ledger, and nominal ledger systems. It is highly likely that your organization has one integrated system for this purpose. You will probably have links to a stock control file. You will probably have the need for an outstanding orders file. If your organization has implemented an automatic reordering system this will be a crucial part of the whole process. These systems become more important as they become more tightly coupled. It is important that there are no gaps in terms of data/information provision.

An interesting aspect of this operational system is that data (information) gleaned from it can actually feed into another system that can be classed as being of a strategic nature – demand forecasting. This data will not guarantee a wholly accurate estimate of demand for your products. Possibly the best you can hope for is a ‘guesstimate’ (somewhere between a guess and an estimate)! However, it may be

Exhibit 7.3.

Mini Case: Nissan Car Manufacturer

Nissan car company has a just in time philosophy in terms of stock delivery. Their suppliers will only get contracts if they can guarantee delivery of the right parts, at the right time, and at an accepted level of quality. Failure to do this may mean they have failed to meet their service level agreements (SLAs) with Nissan. Depending on the contractual arrangements Nissan may be within their rights to terminate the supplier's contract. It is the same with information requirements. Some larger organizations may demand to see their supplier's stock database to try and ensure that parts can be delivered on time. This means sharing information as well as probably integrating systems across organizational boundaries. A precursor for this would be to undertake an information requirements analysis to ensure the correct data and information is passing between the organizations.

possible to get information from other areas of the organization, or more especially from your business environment, to make your predictions more accurate.

It is at this stage that you may identify some gaps in your information requirements. You may be able to convene a meeting with other members of staff where you ask the question, "What other information can we incorporate into our demand forecasting system that may help us predict, with a higher level of accuracy, the demand for our range of products. It may be that there is some information that could be gathered but at the present time is not part of the system. This may be survey data, economic forecasts, or government statistics. Whereas before demand forecasting was undertaken with a mixture of known and unknown data, the future situation will be one where some of the unknowns are now known. This will not make your forecasts accurate but they should be more accurate than previously.

A similar process can take place in other areas. In human resource management (HRM) it may be possible to undertake more effective manpower planning because operational data has been collected from clock cards or computerised employee systems. From this data sickness absence reporting systems may provide useful data. However, other information may be required to undertake more decisive manpower planning. This may allow your organization to formulate more accurate trends in terms of sickness absence.

In many instances information requirements analysis will be a review of the inputs and outputs surrounding existing systems. However, in some cases it might be possible to identify the need for a new system. The following example is from a hospital and shows the various elements that can be included in the analysis.

Example of an Information Requirements Analysis

The following is an example of the use of the information requirements analysis approach in a complex situation – a hospital. This is a situation where there are many stakeholders as well as issues regarding power, control and communications.

<u>HOSPITAL</u>

DEPARTMENT: Maternity

ACTIVITY: Schedule usage of hospital resources

This may include an analysis of operating theatre hours; which clinicians are in attendance; details of mothers & babies to attend, etc.

HOW DONE: Emergencies are prioritised; planned cases are allocated by consultation; patients on the register are booked for consultation.

WHOSE ROLE: Currently Clinicians, consultants, midwives,

EXISTING OR PLANNED INFORMATION SYSTEMS: Register, diary, case notes.

INPUT

- SOURCE: Clinicians.
- FORM: List of consultation bookings; time taken per booking, mother/baby details; care required.
- TIMING: Daily

OUTPUT

- RECIPIENT: Clinicians, midwives, maternity unit manager.
- FORM: Allocation to budget, clinician/staff required.
- TIMING: Daily

MEASURES OF PERFORMANCE: Utilisation rate of hospital resources; monitoring the number of cases ‘turned away’.

INFORMATION GAPS: There is no formal monitoring of the process. Staff do not have time to complete the forms. There is a delay in entering the data from the paper-based system into the computerised system.

COMMENTS: There is no formal monitoring of resource use at present; availability has to be assured at all times due to the nature of maternity services.

PRIORITY: This may need to be decided by committee.

The above example is taken from an actual information requirements analysis within a hospital in the north of England. The entire exercise resulted in nearly a hundred documents similar to the one above. An interesting outcome of the information requirements analysis is that the staff involved in the processes seems to learn a lot more about the systems around them. It gives them the opportunity to empathise with other members of staff in terms of their data and information requirements. The same member of staff can be a data receiver as well as a data sender.

Many staff, especially in large organizations, send data to other areas of the firm but have no idea what it will be used for. This analysis can often lead to employees being more sympathetic about the data requirements of colleagues in other departments. This can be extremely valuable when an organization decides it might be a good idea to introduce a totally integrated system within the organization. It is normally at departmental interfaces that problems occur with new systems. It may be even more important when an organization decides to make information systems links with other firms or outside agencies.

Reverting back to the above example improvements in software and government policy has led to patients being promised more control over gaining appointments at hospital. Through their General Practitioners (G.P.s – doctors) initially and eventually through their own efforts appointments to see a hospital consultant can be made using an external information system (extranet) linked to the hospital. It is anticipated it will give more choice to the patient in terms of where the consultation is actually undertaken – they can choose the hospital.

An information requirements analysis can also reveal issues where manual systems and computer systems interface with each other. It may be something surrounding data input. One group of staff may believe that a database is up to date when in fact the data has not yet been entered. The forms for entering data may be inefficient or incomplete. One group of staff assumes that another group are undertaking an activity and vice versa.

Information requirements analysis may help management to plan for use of resources. This is especially true where resources are scarce, i.e. a hospital or a school. Having accurate information will allow firms to plan more effectively for the future and stop them making erroneous decisions.

With regard to the Acute Hospital example staff had not been keeping data on the number of cases not seen on the day of the appointment – this could be due to illness or just failure to attend the consultation. The hospital thought it would be a good idea to collect this information as it could lead to efficiencies. As it happened the U.K. Government was keen for hospitals to collect that type of data. The majority of hospitals in the U.K. have their own budgets so this exercise was very useful in saving resources and providing better healthcare.

The information requirements analysis is a useful tool that can be used in any organization. Even going through the process of analysis is useful because it tends to improve communications within organizations. It is especially important

Exhibit 7.3.

Mini Case: ICT Utilization in Educational Sector

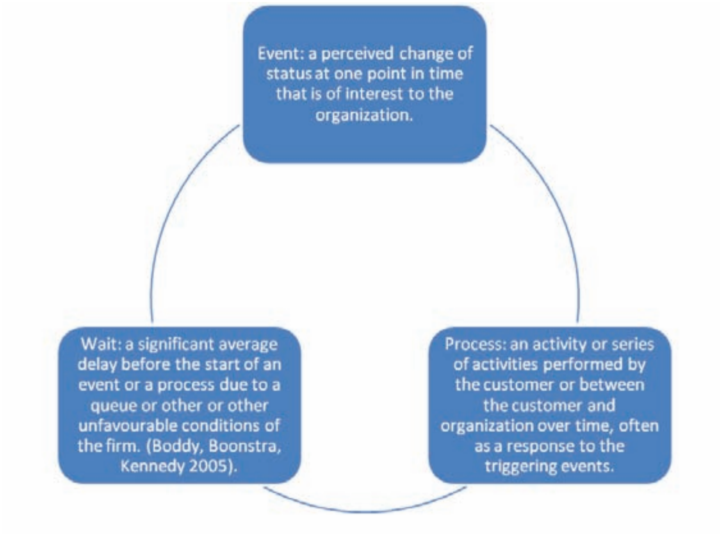
A large Business School in the United Kingdom believed that it had a shortage of rooms. In view of this it was planning to move to a green-field site several miles from its current position. This would have cost the University over £10 million pounds.

When staff tried to book rooms using the timetabling system they were often told that there were no rooms available. This meant that they had to use rooms in other departments and faculties. This was very inefficient as students had to walk quite long distances and could often be late for classes. It also meant that rooms with special requirements could not be booked in advance.

On further investigation it was revealed that staff were block-booking rooms for a full semester. They were doing this even when they only required an extra room for one or two weeks. The system was too inflexible to cope with this request. It would only allow a booking across the whole semester. To ensure that the rooms were available to them the lecturers duly went ahead and booked two rooms. This had a disastrous effect on room resources. Further analysis revealed this problem and the Business School was able to remain on its original site – saving the University a considerable amount of scarce funds.

On further investigation it was revealed that someone had put a figure of 90 on the maximum capacity for a prestigious lecture theatre. Any lecturer that tried to book that room for a class of over 90 was obviously rejected. In fact, that room held 127!

Figure 7.2. Constructs of process mapping



to undertake the analysis in advance of the implementation of a new information system. Do not wait until the system is in place before undertaking your information requirements analysis!

Process Mapping

In 1995, Kim developed an approach that models a process and then uses this model to analyse the process. This approach can be used for both **systematic.design** as well as **green-field approaches**. Within this analysis three constructs are recognized in Figure 7.2

Kim (1995) mentions the following principles for designing the mapping processes:

1. Start with the most critical processes.
2. Reduce the number of process steps by eliminating unnecessary ones.
3. Transform processes into events.
4. Minimise the travel distance. When the chain moves up and down a 'red flag' is raised. The number of involved parties should be as small as possible.
5. Make processes and events parallel to save time.
6. Reduce the waiting time before the process but eliminate it before the event. Events take hardly any time and it is irritating and often unnecessary to have to wait.

Exhibit 7.4.

<u>Mini Case: Marks & Spencer</u>

In 2004, Marks & Spencer ruled out full-scale outsourcing of its IT systems as it began a "back to basics" restructuring programme that will cut $600 million in costs over the next three years. The retailer stated that its immediate priority was not to outsource but to make better use of its existing IT systems. They believed that there were a lot of potential improvement areas in their existing infrastructure that could make IT more effective. This led Marks and Spencer to undertake a major re-evaluation of its IT. They have not ruled out outsourcing individual systems as long as there is a business case for doing so.

Their priority was to simplify processes and to ensure efficient use of the company's existing IT systems before investing in new hardware. They believed that they had some good technology although some departments were better at using it than others. The company expected to focus on using IT to improve management of the supply chain, which was criticised as being less efficient than rivals' systems, and building on other work with RFID tags.

<u>Process innovation</u> can take place by analysing the old processes or by designing a new process from the beginning. Both of these approaches have advantages and disadvantages. In undertaking a systematic design it is worth considering whether it is possible to eliminate, simplify, integrate, or automate. This can almost resemble a brainstorming exercise. Modelling and analysing old and new processes can help in formulating new designs.

This chapter has shown some of the techniques that an organization can employ in advance of information system development. It may even be a good idea for a firm to use some of these techniques just to ensure that its current processes and systems are effective in the current business environment. The following chapter looks at an even more radical approach – business process reengineering.

Business Process Reengineering

<u>Business Process Reengineering (BPR)</u> is the radical redesign of business processes, combining steps to cut waste and eliminate repetitive, paper-intensive tasks to improve cost, quality and service and to maximise the benefits of I.T. BPR involves identifying new ways of carrying out business operations, often enabled by new information and communications technology (ICT) capabilities.

Exhibit 7.5.

Mini Case: Lloyds TSB

Lloyds TSB aims to automate 40% of its back-office work by 2009 to cut processing time for new accounts, after a pilot project reduced turnaround times from 28 to eight days. The bank plans to reduce the amount of manual work carried out by its 5,000 administration staff, who check and verify applications for loans, credit cards and mortgages against several databases, using business process management (BPM) software. The deployment is part of Lloyds TSB's Group Manufacturing Programme which aims to reduce the number of repeated tasks across the business. The software automates verification tasks, allowing staff to process a higher volume of work. Lloyds TSB said that handling employees' reaction to changes in the way they worked was key to rolling out the software and they consulted with staff when designing new practices. Within three years, Lloyds TSB wants to turnaround account applications fast enough to provide immediate responses to customers in banks and over the internet.

BPR has been defined as, "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (Hammer & Champy, 1993).

A problem with BPR is the historically high failure rate among these projects. It has been estimated that some 70% of BPR projects fail, either completely or at least in delivering the benefits that were originally promised.

BPR was originally hailed as one of the most important tools for achieving dramatic improvements in an organization's performance. Conversely BPR was regarded as a fad responsible for large-scale redundancies in the 1990s. It was argued that it failed to achieve many business benefits except for the management consultants involved in its introduction!

BPR has its origins at the beginning of the 1990s and is closely associated with the work of Hammer & Champy (1993) and Davenport (1993). The essence of BPR is that there is recognition that business processes and management structures can be fundamentally altered so that the business itself is better defined, focused and organised.

It has long been argued that ICT plays a major role in BPR. It provides automation; it allows business to be conducted in different locations; it can provide flexibility in manufacturing; it improves supply chain management and permits quicker delivery to customers; it creates or facilitates new business models; and it allows

Exhibit 7.6.

Mini Case: Sandvik Mining and Construction

Even though global management of skills, suppliers, and standards in technology can help reduce costs, by far the greatest contribution information technology (I.T.) can make to an international business is to support a global view of business processes. As world markets open up, more competition enters. One way to remain competitive is to look at processes. The argument goes that if you can do things in more or less the same way, no matter where you are in the world, and then you stand a better chance of understanding and improving your performance. It also helps you find resources and meet demand on a global basis. In manufacturing, the management of physical resources makes globalisation more tangible. Sandvik Mining and Construction, a global manufacturer of mining and construction machinery, is in the middle of a massive enterprise resource planning (ERP) overhaul to create standard business processes. The overhaul is part of a move to enable the company to introduce and support a global change management programme from its Swedish headquarters. The global ERP manager at Sandvik, said the worldwide roll-out of the platform would allow Sandvik to consolidate the company's I.T. efforts as well. "We will have one development team and one development box for the whole company. This will allow central development of I.T. processes", he explained.

rapid transactions between suppliers, manufacturers, retailers and other agencies.

ICT can underpin BPR in a number of important business areas:

1. Reducing cycle time and time to market:

   - Reducing the business process time is extremely important for increasing productivity and competitiveness.

2. Empowerment of employees and collaborative work.

   - The internet and intranets (and possibly extranets) enable empowered employees to access data, information, and knowledge they need for making quick decisions.

Business Process Reengineering can be viewed as a method of significantly restructuring the internal operations of a business.

Exhibit 7.7.

Mini Case: Business Process Reengineering

It has already been stated that BPR is really about radical change for dramatic improvements. This means that a BPR project should prioritize those changes that will bring about dramatic change. A number of BPR projects fail to deliver benefits because equal weight is given to all the proposed changes.

The U.K.'s e-government project could easily have gone that way. It is only recently that the government has become much more realistic about the deployment of its e-government services and it is focusing on those that are most likely to be of real benefit and widely used, rather than simply trying to tick all the boxes for getting everything on-line. For example, the system for electronic land records reduced the time required for searches in house conveyancing. The ultimate solution to galumphing was simply to remove the time window in which it occurred.

The government has also become more effective in terms of purchasing new information systems and the project management of those systems through the use of improved processes. Their main criticism of this project, however, is that the public sector still thinks in terms of information systems projects to deliver e-services, rather than business change projects that happen to be underpinned by new information systems. All too often, new information systems are funded centrally, yet the funding for business change, including training, communications, incentives and opportunity costs, has to be found locally.

These local soft costs will generally be higher than those for the information systems. Perhaps because so few public servants have been enthused with the potential for service improvement (as well as for cost reduction) take-up of those services already on offer has been disappointing.

Service Oriented Architecture

There have been many different definitions put forward to try and define the essence of service oriented architecture. The authors are going to rely on the definition given by Wikipedia. **Service Oriented Architecture (SOA)** is a methodology for systems development and integration where functionality is grouped around business processes and packaged as interoperable services. SOA also describes information technology infrastructure which allows different applications to exchange data with one another as they participate in business processes. The aim is a loose coupling of services with operating systems, programming languages and other technologies which underlie applications.

Exhibit 7.8.

Mini Case: Stround & Swindon Building Society

In the United Kingdom it is the norm for people to borrow money from a Building Society so that they can acquire a house. They then pay the loan back at a certain rate of interest over say 20 or 25 years. The example of the Building Society focusing wholly on its key business process – the mortgage transaction – was widely used as a great example of how an organization could reap the benefits from undertaking a business process re-engineering project.

In 2004 Stroud & Swindon Building Society rolled out a new mortgage application system to help it comply with industry regulations. The software it used automates the work involved in processing a mortgage application from initial customer enquiry and quotation through to completion. This ensures that the building society presents information to customers consistently across all its branches (offices), as required under new regulations for mortgage providers from the Financial Services Authority.

Other benefits of the mortgage application system, which replaces an in-house system, include being able to process more mortgage applications with the same number of staff and an improved customer service.

SOA separates functions into distinct units, or services, which are made accessible over a network in order that they can be combined and reused in the production of business applications. These services communicate with each other by passing data from one service to another, or by coordinating an activity between two or more services. SOA concepts are often seen as built upon and evolving from older concepts of distributed computing and modular programming.

Household products manufacturer Procter & Gamble (P&G) expects to be able to re-use up to half of its internally developed application code across the business within 18 to 24 months, after rolling out a service oriented architecture (SOA). The SOA built using BEA technologies, underpins a web portal that will aggregate business information for P&G's 32,000 managers. The company plans to build up an inventory of applications to deliver information for its business units. It will make them available as services through the portal allowing them to be re-used.

Many organizations have been through mergers and takeovers. Others have developed information systems that have built upon existing legacy systems. Increasing numbers of firms also interface with information systems that cross organizational boundaries. This will need them to integrate information systems

Exhibit 7.9.

Mini Case: Edinburgh City Council

Edinburgh City Council aims to cut its procurement costs by between £3 million and £4 million a year by replacing its paper-based ordering and invoicing systems with an e-procurement system. The council is investing 15 million in an Oracle-based financial ledger and procurement system that will allow the council's main suppliers to receive orders and send invoices over the internet. The system, which is expected to go live in 2006 will also link 25 mainly Unix-based legacy systems used by the council to manage everything from the payroll to council tax.

It will provide managers with detailed analyses of their budgets and spending through the council intranet, eliminating the need for managers to request reports from the council's accounts department. The Council believes that they will become a more intelligent purchaser as they can negotiate better deals with their suppliers. The new system will also automate a lot of financial processes from procurement right through to payment. Edinburgh City Council plans to provide its top 100 suppliers, which are responsible for 80% of the council's purchases, with access to the financial system over a secure internet connection.

The Council expects to make 80% of the savings by aggregating orders for goods from 500 premises in Edinburgh and using the bulk purchases to negotiate better deals with suppliers. The rest will come from improved efficiency and reducing central support staff. The biggest technical challenge will be developing the interfaces between the e-business suite and the council's legacy systems. A lot of staff with knowledge of the legacy systems have left the Council. Staff were asked for feedback on the system design and will be involved in acceptance testing later in the year.

and share knowledge as they attempt to consolidate these alliances. One result of this may be more dynamic resource scheduling (Shen et al 2006). However, it is one thing to integrate different systems across organizational boundaries and another to ensure that you are also able to add value to business processes (Maurizio et al. 2008)

FUTURE TRENDS AND CONCLUSION

The systems development life cycle (SDLC) has served the information systems (IS) quite well over the last 40 years. However, it is important that organizations, and especially SMEs, have a range of tools, techniques, methods, and methodologies that they can use depending on the particular situation. This chapter has only introduced a small section from a myriad of existing approaches.

A key driver in future business environments will be the ability of firms to react quickly in different business situations. This is especially true of SMEs who may identify 'niche' opportunities in the wider market. It is also important to remember that simply 'laying' ICT on top of existing systems would be a recipe for disaster. For any of these approaches careful planning needs to be undertaken before they are employed.

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Chapter VIII
System Development and Project Management

The majority of tools, techniques, and methodologies in the domain of IS and IT have been developed with large firms in mind. This is true of the support provided in the areas of project management, system development, risk management, benefits realisation, procurement, and the formulation of IS and IT strategies (Maguire, Koh, & Magrys 2007).

INTRODUCTION

Nearly all information systems developments follow a structured approach. This is true of all projects. This chapter takes a critical look at both system development and project management.

The development of computer systems is a complex process, one with many opportunities for things to go wrong. To try and control this complex process, a methodology was required that would bring more discipline to the computer system development process. There was a need to make more efficient use of the resources that were available.

However, the use of accepted methodologies for system development has not guaranteed the successful implementation of information systems. There are still weaknesses in the traditional methodologies. This section examines some relevant current literature regarding the system development process and identifies areas of weakness that could be improved.

In the UK the National Computing Centre in Manchester defined the system development process as a number of stages. Seven were identified: feasibility study; systems investigation; systems analysis; systems design; systems development; implementation; and review and maintenance. These stages were later revised but are still generally viewed as the key elements of the computer system development process. This defines the development process as a technical one.

Many methodologies that have adopted this type of approach have become grouped under the heading of 'hard systems methodologies'. This structured approach has proved popular with IS/IT professionals since it caters for their needs as technical staff who view information system development as systematic problem-solving. It is not surprising that some authors have a narrow view of what is entailed in the system development process. Some regard it as simply structuring hardware and software to achieve effective and efficient processing of the information system.

The System Development Lifecycle

Developing information systems has always been an expensive process. Even today in the United States it is estimated that fifty percent of all capital expenditure by organizations is spent on computers and telecommunications. As a number of computer projects failed dramatically increasing attention was given to controlling the development process. It was hoped that a structured approach to development, incorporating the 'System Development Life Cycle' (SDLC), would lead to a more efficient control of resources.

Even though the SDLC has become a traditional method it represents a significant improvement over a variety of undisciplined earlier approaches. The System Development Life Cycle is still viewed as being appropriate for medium-to-large computer projects (Hoffer et al. 2005). It is viewed as the traditional paradigm for managing the development of information systems. Even small-scale information system projects borrow techniques from the **System.Development.Life.Cycle**.

The life cycle methodology is seen as being appropriate for computer development projects that are highly structured and well-defined. The system development life cycle is linear in nature. One stage finishes, is 'signed off' by users, and the project team move on to the next stage. It is generally accepted that once the system is under development no changes will be made until the system is finally implemented. The literature on information systems development focuses predominantly on technical issues. Even in the 21st Century when personal computers proliferate in most organizations, the technical aspects of systems development are still seen as being of paramount importance in the overall process.

During the 1960s and 1970s computerised information systems were developed using mainframe computers. Second and third generation programming languages were used for computerised systems. This meant that technical specialists were the main influences on system development. Senior management delegated the responsibility of developing information systems to a small team of technical experts within the organization, allowing them control over the process. This system development process was often resource-intensive.

Some writers have identified the phrase 'system development life cycle' as being appropriate because the system will not last for ever: a cycle comes to an end. The system will inevitably go into decline as the requirements of the organization change over time. Once the system has been implemented it should be maintained and reviewed at regular intervals. This system evaluation and review may reveal that the system is already inappropriate for the needs of the organization. The use of the word 'cycle' in system development lifecycle is appropriate because at the review stage the decision could be made to start all over again because the system is already inadequate. It could be argued that the phrase 'system development life cycle' is wholly appropriate because computer systems never 'die' and the system development process is on-going.

The structured methodologies may provide the project manager with the tools and techniques to plan, execute, report and evaluate the development effort. This project management facility has endeared the SDLC to many managers. However, while control is being exercised at an operational level the business requirements of the organization may be changing. It may be possible to meet the aims and objectives of an individual system project without contributing to meeting the needs of the overall organization.

It would appear that the SDLC will in principle allow control of the process by one individual or a small group of staff. For instance analysing, designing, implementing, and evaluating computer-based information systems could be the work of systems analysts.

A common criticism of systems analysts is that they assume a computerised solution before they undertake their work. They are viewed as technicians but are also given a major role in the development of computer systems with organizational implications. They can be involved from problem identification through to the maintenance of the new system.

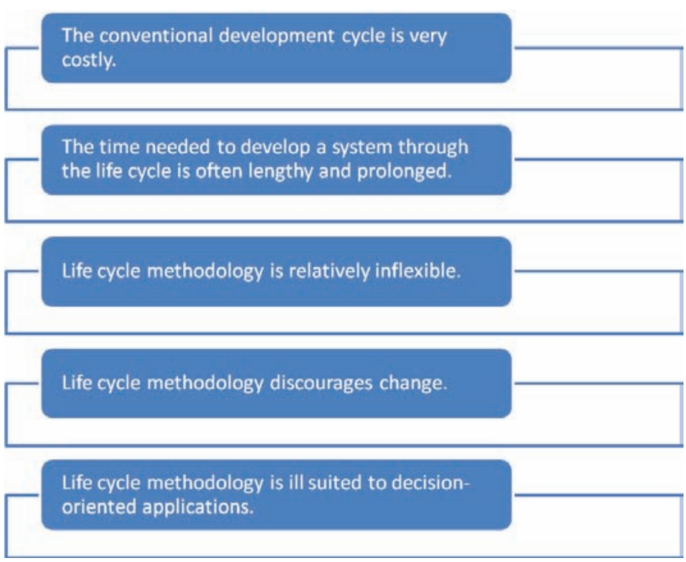
At one and the same time they are expected to have the 'vision' to be able to identify effective systems for the organization, while undertaking the role of technician during the system development process. System developers nowadays have an extensive range of tools and techniques that they employ during the system development life cycle. This reinforces the technical image of system development. The use of these tools and techniques can often exclude users from the process if they do not have any technical expertise.

Information systems development is perceived as being a practical discipline and the textbooks in this area generally propound the view that the only way to be skilled in this area is to gain experience in the field. As the textbooks have a predominantly technical focus it follows that practitioners in the field will take a similar stance. Thus systems development has often been identified as a practical, technical, process. Less research has been undertaken on the non-technical issues (Jessup & Valacich, 2006). It is not only technical staff who value the use of the system life cycle. Staff with a business user background can also use elements of the life cycle (Curtis and Cobham 2005).

Weaknesses in the SDIC

It is fairly easy to identify weaknesses in system development life cycle methodology. The SDLC is not a panacea for the problems of computer projects. Even when companies go to the trouble to establish a formal and comprehensive SDLC, projects still fail to achieve their objectives. There is a need to critically appraise the way we carry out computer systems development. It should not be seen as purely a series of formalised technical processes (Brooke and Maguire 1998, Maguire 2000). System

Figure 8.1. Major weaknesses in the system development life cycle



design, in particular, although it has been with us for only a comparatively short period of time, appears to have become structured and formalised and to embody a problem-solving philosophy which is accepted uncritically by these practitioners. This approach sees the design of computer systems as a technical process directed at solving problems which are defined in technical terms. Laudon and Laudon (2003), identified major weaknesses in the system development life cycle as shown in Figure 8.1

However, it could be argued that it is not possible to redesign a robust, effective information system incorporating significant amounts of the technology, without treating it as a social system. Even though the technology has improved over the last thirty years there are still too many examples of failed system implementations. Problems today are still more abundant than solutions. Many firms experience rising ICT costs rather than cost reduction. ICT misuse and rejection are more frequent than acceptance and use.

In general the literature shows a heavy bias towards technical issues within the literature on information systems development. Another way to view information systems development is as a technical process with social consequences. This has implications for the choice of system development methodology. System development should take into account the cultural, social, political and moral aspects of system design. Users require system methodologies that allow their participation in the overall process. This has consequences for the information system designers who need to take account of the changing needs of users and view the study of IS as multi-disciplinary. The implementation of information systems is similar to any implementation of technology. It may disrupt the existing working practices. This could have a detrimental effect on the organization.

It is quite easy to put forward the view that effective information systems can be implemented if users, management, and IS staff work as a team during the system development process.

This section has identified the dichotomy in the information systems area. On the one hand it is seen as a technical discipline; on the other it is seen as being eclectic covering a range of behavioural, cultural, economic, social, and political issues. There have been calls for new paradigms to be used for information systems research. The point to be made is that different research paradigms, whatever they are, will have important implications for the development of information systems. The technical aspects of information systems have been unable to tackle the key issues in a complex, changing environment, and there is now support for qualitative research in information systems.

The use of the system development life-cycle does not guarantee a successful information system project. It can, however, be used in conjunction with a project management methodology. However, even this should not lead to complacency as many projects can fail!

ICT PROJECT MANAGEMENT

Definitions of a Project

A project is a set of people and other resources temporarily assembled to reach a specified objective, normally with a fixed budget and with a fixed time period. Projects are generally associated with products or procedures that are being done for the first time or with known procedures that are being altered. (Graham, 1985).

A project is a unique venture with a beginning and an end conducted by people to meet established goals within parameters of cost, time and quality.

Project management is the combination of people, systems and techniques required to coordinate the resources needed to complete projects within established goals (Dinsmore & Cabanis-Brewin, 1993).

The Reality

Estimates in the United States showed that $140 billion is wasted each year on failed projects or cost overruns. More specifically, over $81 billion is being spent on failed ICT projects. This is not a recent phenomenon. A survey of 400 British & Irish companies revealed that only 11% were successful in their application of ICT (Kearney 1990). Thirty percent of large ICT projects in the U.K. run over budget and over time. Forty-six percent of ICT applications were delivered late and 48% delivered over budget (Butler Cox, 1990).

A North American survey showed that with office automation applications 10% fail owing to technical problems, 90% due to organizational problems!

Phases of a Project

At a very basic level a project can be viewed in a clinical way as an entity with a clearly defined start and end date as shown in Figure 8.2.

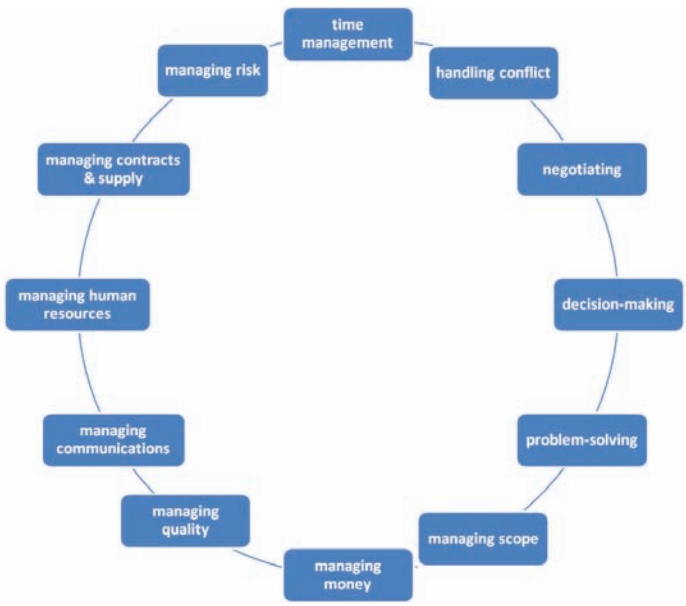
Key Issues

It is interesting to try and document what the key issues are in ICT project management as shown in Figure 8.3.

Even though *managing risk* is the last issue in the above list it could be argued that it is the most important aspect of any information system project. This is

Figure 8.2. Phases of a project

Figure 8.3. Key issues in ICT project management



especially true when hundreds of millions of dollars are being spent on new IS implementations Recent research incorporating a survey of 194 project managers has shown the importance of managing a priori and emergent risk factors (Gemino et al 2008).

When project managing a substantial information systems development project there are many different issues to consider. These may involve a significant number of different stakeholders. Some of these individuals will be outside the project team or steering group. The following list shows what needs to be improved and monitored during the process as shown in Figure 8.4

Figure 8.4. Key issues for improvement and monitoring

(Adapted from Reiss & Pyne, 2006)

A Structured Approach

Development for an ICT project should not be seen as an operational issue. This project could have enormous repercussions for the organization in terms of financial benefits. It is very important that a clear overall strategy is put in place. This ensures that this particular project will have the support of senior management and that it will be an important part of the firm's business strategy. Once again it is worthwhile having a structured approach for the overall process.

Many governments around the world are viewing ICT as a way of making their procedures more efficient and effective. Some are even viewing it as a way of becoming more visible to the general public. Whatever the reason by their very nature they are likely to be large, long-term, complex project. In these situations there are lots of opportunities for things to wrong. The following Mini Case gives an overview of the experiences of the U.K. government in their use of ICT.

Exhibit 8.1.

Mini Case: ICT Development in UK Government

The U.K. Government is putting a lot of resources into an ICT development under the name of e-government (electronic government). It has also been referred to as "joined-up" government - where different departments and agencies will be able to share information thanks to the potential offered by ICT. However, it is very important that senior politicians and civil servants show strong leadership, maintain continuity and ensure everyone is committed and buying into the strategic objectives of this large, complex and expensive project.

Changes in the project team and to reporting, responsibility or accountability structures not only bring about shifts in priorities but can also result in a drop in confidence and morale or a reduction in momentum across project teams. The British Government could do well to emulate the lessons learnt from local government modernization so as to combat the silo mentality existing in current departmental initiatives and which affects most businesses to some degree.

Silo mentality is where individual departments look after their own interests rather than those of the wider organization. This can lead to sub-optimization in relation to project benefits.

When embarking on enterprise-wide projects large corporations dedicate a lot of effort and resources into programme management to review and assess the progress of projects against individual milestones and in terms of the programme as a whole. This good practice should be applied to the e-government strategy to ensure that not only are all the targets reached by 2005, but also that departments really can operate as a "joined-up" entity.

Key Functions of the ICT Project Manager

Many large ICT projects are just as much about politics and power as they are about technical issues. This puts added pressure on the project manager. In many cases, he/she needs to be a:

- Negotiator
- Communicator
- Unifier
- Planner

PROJECT FAILURES

It is fair to say that when ICT projects go wrong they can go spectacularly wrong. The Mini Case in Exhibit 8.2 shows all the elements of a classic ICT project failure.

Please view the above cases study as a set of learning possibilities that should ensure that your firm will never make similar misjudgements.

The textbooks on project management may give some useful advice but generally speaking they put forward an idealised perspective on ICT project management whereby if you follow the steps everything will work out fine. However, there are too many examples of system projects failing for us to have a lot of confidence in this approach. When we consider that we are trying to undertake these ICT projects in turbulent business environments the task is even more difficult.

We have looked at information systems and project methodologies. Do we have to always take a very structured approach to information systems development? Not necessarily, and the next section gives an insight into a number of alternatives.

Other Approaches to I.S. Development

From the 1950's onwards it was realised that systems engineering must be seen as the total task of conceiving, designing, evaluating and implementing a system in order to meet some defined need. This can be illustrated as follows:

1. Problem Definition
2. Choice of Objectives
3. System Analysis
4. System Design
5. System Selection
6. System Development
7. **Concurrent.Engineering**

At the same time systems engineering was being developed there emerged systems analysis which was associated with the RAND Corporation (hard systems). The use of Operational Research established the value of scientific analysis. Early

Exhibit 8.2.

Mini Case: Magistrate's Project in the dock !

Post mortems on the failure of the £390m Libra contract to deliver a unified case ***management system*** *to magistrates' courts in England & Wales have identified several key lessons. One is the: STANDARDISED COMPUTER SYSTEMS NEED STANDARD BUSINESS PROCESSES. Also, the department, like the NHS in its implementation of a £2.3bn IT-led modernisation programme, pointed out that it did not have the authority to impose business process change on the independent Magistrates' Courts Committees. And it was reluctant to attempt further major change while the committees were going through other reforms.*

Libra's 12 years of delays and excuses

- ***1992*** *A contract for national case-working software, to replace incompatible systems in use in magistrates' courts, fails. The Lord Chancellor's Department takes legal action against the supplier Price Waterhouse*
- ***1993*** *The department begins an in-house project using Admiral and FI Group, but this fails too. The department pays out £6.8m*
- ***1995*** *PricewaterhouseCoopers agrees to pay the department £1.3m but it is unclear who pays the legal costs*
- ***1996*** *The department launches Libra, its third attempt to introduce national sys tems for magistrates' courts*
- ***May 1998*** *EDS withdraws from the bidding leaving only ICL, now called Fujitsu, which submits a tender for £146m*
- ***October 1998*** *Fujitsu increases bid price to £184m*
- ***December 1998*** *The department awards Fujitsu a 10-year contract for £184m*
- ***October 1999*** *Fujitsu seeks to renegotiate the contract as it forecasts a loss of £39m over the life of the deal*
- ***May 2000*** *The department signs a revised deal for Libra. The contract is now for 14.5 years and is worth £319m*
- ***June 2001*** *While rolling out networked office automation systems to the courts, Fujitsu tells the department it cannot continue with the contract unless it is substantially revised.*
- ***September 2001*** *Fujitsu threatens to repudiate the contract unless the department agrees to cover its losses which are now estimated at £200m*
- ***February 2002*** *The department decides not to proceed with the core case management software from Fujitsu*
- ***July 2002*** *A revised contract is signed with Fujitsu for £232m over 8.5 years to supply only the infrastructure element of Libra.*
- ***2003*** *STL Technologies agrees to supply Libra's core management system. A further contract is signed with Accenture to roll out STL's software in court rooms and offices. The cost of the contract is put at £390m*
- ***2003*** *The National Audit Office says Libra from STL and Accenture is "essential" to a plan to unify the administration of crown, county and magistrates' courts in April* ***2005***
- ***September 2004*** *A leaked document reveals that the Department for Constitutional Affairs is concerned about software errors, fit for purpose issues, revising the roll-out timetable and "performance issues despite a tenfold improvement. The implementation was due to be completed in early 2006.*

Operational Research was mainly for tactical military purposes but later this became what is now called systems analysis which is broader, less quantitative in method, and more oriented towards analysis of broad strategies and policy decisions.

Systems Engineering comprises the set of activities which together lead to the creation of a complex man-made entity. Systems analysis is the systematic appraisal of the cost and other implications of meeting a defined requirement in various ways.

The main characteristic of all 'hard systems' is that real world problems can be formulated as the need or objective to be obtained, and an ordered way of selecting the best among alternative systems that could fulfil that need.

The next step was to apply hard systems thinking to 'soft' problems, i.e. the application of systems analysis methods to problems of public policy. Systems analysis was used as a vehicle for the design of systems of criminal justice, waste management, transport, etc.

Problems arise as hard systems require a clear description of objectives at the outset. This led to the development of Soft Systems thinking. Using a Soft Systems approach problems may be accepted as unstructured. Perceptions of problems are subjective and situations change over time. There are a number of texts available that deal with the interface/overlap between hard and soft systems methodologies (Wilson 1984, Lewis 1994).

System Methodologies

The choice of **system.methodology** is an important decision to make before the system development process gets underway. The majority of medium/large information systems implemented in organizations have been developed using 'hard', structured techniques. There is, however, an argument that organizations should become more conscious of their choice of methodology to cope with the changes outlined in the previous chapter. Organizations should be in a position to choose from several systems development methodologies. This choice could be decided by the current competence of staff in ICT or the experience of information systems staff within your firm. Recent research has identified how a particular organizational culture can have a significant impact on the choice of system development methodology (Livari & Huisman, 2007, Kappos & Rivard, 2008).

The development of Information systems should not just be seen as a technical issue. We have seen from the previous chapter that there are many important elements that may decide whether an information systems project will be successful. This may mean combining financial, organizational, technical, and behavioural issues together to arrive at a successful outcome.

If information systems staff continues to take an exclusively technological view of system development then there is the possibility of technical 'success' but organizational failure. Many system developers are unable to get a clear balance of concern for technical issues on the one hand and social and behavioural issues on the other. The IS discipline is eclectic and there are a variety of approaches available for information systems development.

It is probably not worthwhile, however, to have two separate strategies, one incorporating the technical issues of system development, and one incorporating the change management and project management issues. The search should be for one strategy that ensures the effective introduction of the information system within the organization in question by tackling its problems holistically. It may be a good idea to provide a system methodology that uses techniques flexibly depending on the various problem situations ranging from relatively structured to unstructured. The choice of methodology will be very important.

The key area that must be addressed, whatever methodology is selected, is the decision-making requirements of purposeful managers. That is where the thinking must start (Checkland & Holwell, 1998). It is not enough that new systems 'work', they have to improve effectiveness in the workplace. It is very difficult for staff to understand the benefits of information technology when they can see no direct link between the new system and improved operations. There are important lessons here for complex organizations.

Choice of Systems Methodology

Some organizations have little flexibility in their choice of system methodology. For instance they may be expected to use a **'hard'.system.methodology**, such as **SSADM.(*S*tructured.*S*ystems.*A*nalysis.*&*.*D*esign.*M*ethodology**) because that is the accepted company standard. This may also be the case with the project management tool that is used, such as PRINCE/PRINCE 2 (*Pr*ojects *in* a *C*ontrolled *E*nvironment). It is widely regarded that information system development methodologies are placed on a continuum with 'hard' approaches at one end and 'soft' approaches at the other.

Hard vs. Soft

The most prevalent way of differentiating between system methodologies has been to bracket them as being either 'hard' or 'soft'. This is not always a helpful differentiation as it implies that a hard methodology is opposite to a soft methodology. This, in fact, is not the case and it is possible to use both methodologies on the same project. Professor Checkland at Lancaster University developed and refined his Soft

Systems Methodology (SSM) over a number of years. It has become recognised as the archetypal soft systems methodology. , The success of any methodology should be how relevant its application is in a number of different business, technical, and management situations. SSM has built up a large number of successful applications across all sectors. It is important to note that SSM has been used successfully in a significant number of projects. It has also been successfully grafted onto a hard systems methodology for a successful project. However, it may be good advice to acquire specialist help before going ahead with this approach.

Professor Enid Mumford developed a system design methodology called ETHICS. This acronym stands for the Effective Technical and Human Implementation of Computer-based Systems. The argument is put forward "that people should be able to influence the design of their own work situations and that if this kind of intervention is encouraged then there are likely to be both job satisfaction and efficiency gains". (Mumford, 1983).

Can we compare hard and soft methodologies? (see Table 8.1)

It is not intended that a reader of this chapter will become an expert in the use of Hard and **Soft.Systems.Methodologies** by using these materials. It is important, however, to be aware there is more than one methodology. You will then be in a better position to judge which course of action to take for a particular system implementation. There are also a number of key texts that can be referred to that will support your understanding of the various concepts (Checkland, 1981, Checkland & Scholes, 1990).

What System Methodology Should I Use?

This is a classic situation where the phrase 'horses for courses' can be introduced. The culture within an organization may be a crucial factor in deciding which approach to adopt. The size and complexity of the IS that is being developed will have a significant bearing on which approach is chosen.

Table 8.1. Hard vs. Soft Methodology

Hard	***Soft***
Technique	Methodology
Structured	Unstructured
Systematic	Systemic
Problem Defined	Problematical
Non-optimisation,.a.learning.approach	Situation-complex
Optimisation	Flexible
User-independent	User-dependent

Why is it important that we understand the system development process?

- The speed and complexity of the development of IS within organizations may be having an adverse effect on those groups interfacing with them.
- This makes the choice of methodology even more important to IS success. The decision should be made after thorough research by the organization.

FUTURE TRENDS AND CONCLUSION

Chapter VIII includes a significant amount of material. There are good reasons why this area is viewed as being important. Developing or purchasing ICT may be the largest capital outlay a firm undertakes. It is likely to be the project that has the biggest influence on the greatest number of staff. There are too many recent examples of where organizations have failed to effectively implement their information systems (IS). Utilising IS and project management methodologies will give them the opportunity to plan for future developments. However, even using these approaches will not guarantee success.

One of the key goals of the project manager is to engage potential users with any new system. When the system goes live staff must understand why its future use will be beneficial to the firm. In the future, if an organization has a range of methodologies at its disposal it can choose the one that is appropriate for the particular situation in question.

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Chapter IX
Critical Success Factors for ICT Development

More often than not, development programmes are not properly aligned to the needs of individuals or the business. Organizations are still undertaking far too much in the way of training for its own sake or ad hoc programmes that are not tailored to the long-term goals of the organization or the aspirations of the employees concerned (Chartered Management Institute Survey 2007).

Business continuity needs to be done in advance for the longer term to enable proper planning, implementation and testing of systems (Managing Director, disaster recovery firm, 2007).

INTRODUCTION

If organizations were good at ICT planning there would not be as many information systems failures. There is a definite need for improved **communication** and collaboration between individual employees, i.e. for electronic mail, task and meeting scheduling, group decision support or video-conferencing. The functional departments & business units can collaborate to change the business focus of the organization, i.e. for just-in-time manufacturing, identifying cross-selling options or standardising the customer interface.

The first stage of ICT planning is referred to as strategic information technology planning (SITP). SITP can refer to a process of searching for strategic information systems (SIS) applications that enable an organization to gain a competitive advantage (Turban et al. 2004). The typical reason a firm might develop a strategic information system is to help the organization enter a new market, gain or maintain market share, or improve the service to customers (Jessup & Valacich, 2006).

PROLEMS IN ICT PLANNING

There are problems surrounding the classical strategic **ICT.planning** methods:

- Weak partners in the business chain, i.e. for tele-marketing and tele-shopping of customers, shared business intelligent systems or integral supply chain management.
- The rigidity & often long throughput time of these kind of planning exercises.
- The basic premise of traditional strategic **planning.methodologies** is a corporation-wide, top-down prioritisation of all it applications that are deemed necessary.
- Business reality is often much more dynamic than the planning structure embedded in these methods.
- The relatively reactive nature of these methods, with consequently little attention to innovative, groundbreaking ICT exploitation.
- The exclusive attention to ICT in administrative, supporting processes.
- Traditional planning methodologies pay little attention to ICT in primary processes and in the products and services of modern organizations.
- The focus of data and **application.architectures** within autonomous organizations with central data storage and information processing.
- ICT-based infrastructure planning should cover a broader range of issues and take into account the existence of relatively autonomous parts of an organization.
- The lack of sufficient techniques for evaluating **investment.proposals** in order to justify the allocation of limited funds.

When you are considering the introduction of a new information system for your organization it is imperative that you have a robust plan in place. It will be impossible to please all the various stakeholders with a new system. The **role.of.**

users is still the most important factor in the development and use of new information systems (McLeod & Schell, 2004). However, you will have to satisfy as many of the potential users as possible. It is very rare that an information system can satisfy the requirements of individual users. Usually, the best you can hope for is to implement a system that can provide useful information for a group of staff. These staff may be in the same department or more likely these days they will be in several departments working on the same system or project (Maguire & Redman, 2007).

If you were trying to be very democratic you could ask everyone in your organization what system would you like and what would you like it to do for you personally. In terms of ICT planning this would not be very successful. You would end up with reams and reams of paper and it would be impossible to put in place a coherent strategy. However, every effort should be made to involve as many users as possible (Bocij et al 2003). As you know from chapter seven a very important part of the planning process is to prioritise the systems you are thinking of developing. This prioritisation should be based on the key strategic elements of your firm's business plan. At the very least you should strive to ensure your particular ICT development has a significant chance of being successful (Carugati, 2008).

If you are developing a system for a particular department it is very important that you have experience of that functional area on the **project.steering.group**. In other words if you develop a system in Finance it is imperative that you have you have someone on the team that has experience of accounting and financial systems. It may be a member of the department *and* the system developer that have those skills and experience. Try and put in place a policy that ensures this will happen. The problem with developing information systems in isolation for a particular department is that there is a good chance that they will need to link up with other systems within your organization at a later stage (Luftman, 2004).

Providing the appropriate education and training is crucial at this juncture. However, it needs to be undertaken at the right time, by the right people, delivered by the right people, and at the correct level of detail to be relevant to those staff being introduced to a new information system (Bocij et al 2003). Employees may require user and reference guides, user training and tutorials, as well as installation procedures and troubleshooting suggestions (Jessup & Valacich, 2003).

This is a key element of ICT planning: Think ahead

What systems will your organization require in one, three, five years time? It is difficult to undertake ICT planning when technology is changing so dramatically. It would be worthwhile undertaking an information requirements analysis; it may even be very useful to carry out a process mapping exercise; or even to put in place a business process reengineering project. Do not wait until you have implemented your ICT before thinking about any of these activities. These areas are interlinked and the larger the project the more chance there is for an expensive failure. However, gleaning benefits from enterprise-wide systems development appears to be a random situation (Karimi et al 2007).

Computerisation is not a magic formula for success. It needs careful planning and it is very important that your communication, integration, and **business.process.issues** are addressed before going ahead with any planned implementation. Remember the output from one system will be the input into another. If you have effective business processes and systems in place the technology issues should be reduced in scale.

It is very likely that your senior management would like to have full utilisation of a new system. It is very rare, however, that any organization will be able to utilise every facet of a new system or software. Basically, most firms concentrate on those parts of the software that are relevant to the chosen organization. However, if your firm decides it wants to take advantage of every facet of the software it could be a bad planning decision. It will probably take your organization at least 80% of the time to take advantage of the last 20% of the available facilities offered by the software (generally referred to as the **80:20.rule**). From a planning or business perspective this will not be good for your firm. You will need to be pragmatic and realistic when purchasing software. There may also be training issues attached to your software utilisation plan.

If at all possible you should have top level support for your ICT plan. Management can play a major role in the overall process. They should have a good understanding and awareness of your organization's business plan (Jessup & Valacich, 2006). In some cases they may be able to have a good vision of what ICT can do to improve the business (Gupta, 2000). They are likely to be the sponsor of any new system and as ICT projects have a habit of going over budget this is very important. Senior management are also likely to want to set objectives for the new information system. Recent research has shown how top management participation in enterprise resource planning (ERP) projects can have a significant effect on ERP usage (Liang et al. 2007). With global information systems it is just as important to gain the commitment of subsidiary managers (McLeod & Schell, 2004).

Make sure that you develop information systems that staff wants to use. Think of it in this way. Your information system is a product. However, the key issue is the market – or the department/s where it will be used. The users are the customers. If they do not 'buy' your system the whole process has been a waste of time (Bocij et al 2004). In the same vein it may be a good idea to not raise expectations too highly. By all means ensure a very tight project control but do not promise parts of the system by a certain date and then fail to deliver. This will increase the frustrations of the user group. If computer software is simple and intuitive to use it will be user friendly (McLeod & Schell, 2004). It has been generally accepted over the last 30 years that information system implementation failures owe more to organizational and psychological issues rather than technical issues (Au et al. 2008).

Testing is such an important process as it allows an organization to identify errors before the information system actually reaches the vast majority of users (Bocij et al 2004). Existing users are usually the best group of staff to provide valid test data for a new system. They are not only able to generate effective test data they are also in a good position to evaluate the results of any system testing. This is extremely important where systems are being tested in a modular fashion.

Testing is usually broken down into three types: developmental, Alpha and Beta. It is usually in the Beta testing where the capabilities of the system in the user environment are actually tested by members of an organization's staff (Jessup & Valacich, 2003). Until all the modules are integrated and tested together it is very difficult to be sure whether testing is in fact complete. As the users are so close to the system they should be able to identify the early-warning signs of any particular problems. The systems professionals must view this stage as high priority. They will be responsible for the system when it is up and running. In the early stages of acceptance testing it is relatively inexpensive to rectify errors (Gupta, 2000).

Testing should be robust and far-reaching. Early problems with a new system can often lead to users being disenchanted and they may wonder why the change has taken place. Data for systems testing should be drawn from 'live' data. It is important that all exception conditions are catered for during the testing. This can be a very painstaking process. However, any errors must be found at this stage and therefore it is advantageous to draw up a chart of expected results when the test data is initially created – this may include things such as processing times. It will be beneficial to include auditing staff during this process. Controls within the system are very important. Audit trails are just as important today as they have ever been. A number of very important questions have to be addressed before a new information system can be presented for implementation:

Will the System Produce the Desired Results Under Known Conditions?

Test data must be carefully prepared and (1) the results should be reviewed, (2) corrections made, and (3) possibly redesign the system.

Unit/program.Testing

Testing each program in the system.

Overall.System.Testing

Tests the functioning of the system as a whole and discrete modules function together.

The project team need to test:

- Performance times
    - The capacity necessary for the new system.
    - Handling peak loads.
- **Recovery.&.restart** capabilities.
    - Manual procedures.

Eventually the decision will have to be made to go live with the new system. This is referred to as acceptance testing. It is very important that senior management play a role in this decision.

Systems test should be evaluated by users and reviewed by management.

It is worth noting that up to 50% of a budget can be expended on testing. It is very time-consuming.

Imagine that you were in control of an existing system. Would you sleep at night knowing the speed and capacity of the system you were controlling was as complex as the recent examples below?

Exhibit 9.1.

Mini Case: Amadeus Airline Reservation System

Amadeus is an- airline reservation system with some of the significant capabilities such as 180,000 terminals generating more than 6,000 transactions per second Speed. The airline utilize Sabre database that contained 45 million fares from 650 airlines and the challenges is to maintain 40,000,000 changes every month. In addition, the airline also has more than 500,000 passenger name records created every day and has over 30,000 agency locations and more than 130,000 terminals attached to the system. Because of the transactional complexity, the airline has to deal with 5,200 transactions per second. Users are urged to add clauses requiring suppliers to scan systems for vulnerabilities.

Lessons on Software Security Update

- *Known vulnerabilities in commercial software have doubled during the past year to more than 2000*
- *Suppliers are continuing to sell systems full of critical vulnerabilities.*

Exhibit 9.1.

Mini Case: ICT in Travel Sector

A well-established UK travel firm designed a new application to provide 6,000 staff across 800 branches with sophisticated searches to allow clients to put together holiday packages. But when the roll-out started in early 2002, problems emerged. The threshold in terms of numbers of users was well below what was needed. The aim was to put 6,000 users on the new system with a service level agreement (SLA) that stated the application's response time should be 12 seconds or less, 90% of the time. However, the full roll-out could not be completed. They could only get 1,500 users on the system and the response time was higher than they wanted.

Do not embark on a long, complex internal system development programme if it is going to tie up many of your key staff for several years. If you can buy some adequate software off the shelf this may be a better plan for your organization (see 80:20 rule above).

If you decide to purchase the software and systems be very careful of your relationship with suppliers/consultants. This is especially true when you are signing your contract agreement. Don't forget that they are probably writing similar contracts on a weekly basis whereas you may be signing them every few years.

Areas of Concern

- The response time
- The degree to which data must be up to date
- The volumes (metrics) of input/output activity help determine the type of system needed.

FUTURE TRENDS AND CONCLUSION

Guiding staff towards looking forward to their future information needs is critical in ICT development. If a new system goes live and it contains a number of obvious errors, staff will soon become disillusioned – they will probably yearn for the old system! Once again, user involvement in the overall development process is very important.

Historically, organizations have developed IS in an incremental fashion, usually constrained by existing legacy systems. In the future vendors will increasingly market the benefits of purchasing off-the-shelf, organization-wide systems – revolution rather than evolution.

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Chapter X
Impediments to the Successful Implementation of ICT

For many organizations, the implementation of a new information system (IS) may be the biggest capital expenditure they undertake. If substantial amounts of capital are committed to these developments it follows that every effort is needed to ensure that they are successful for the overall well being of the organization (Maguire & Redman 2007).

A considerable amount of disruption can occur when an information system (IS) is introduced. There is a possibility that the IS may also be dysfunctional to the organization for several years after the system has gone 'live'. (Maguire 2004).

There is the thorny issue of how you are going to make sure that your staff are capable of realising the benefits from ICT. You should have a clear idea of what strategies you can adopt with regard to training, who in your company decides on training and where training resources are employed with respect to your overall strategy (Computer Weekly 2007).

INTRODUCTION

One of the main criticisms levelled against information systems (IS) in organizations is that they are inflexible. Even minor changes in the environment can make some systems redundant. Most change is inevitable but that should not stop organizations putting in place contingency plans to try and counteract the worst effects of any change. Whenever possible IS should be developed from the standpoint that some change is inevitable.

Many systems projects would be successful if the environment for which they had been developed had not changed over time. Most organizations are finding themselves in competitive, changing environments. This situation is often accentuated when the organization is unable to react quickly to changes in the business environment. Many organizations have been operating in an increasingly turbulent environment over the last 20 years. Change is no longer the exception but the rule. Changing organizational structures and staff groupings have led to a need for greater flexibility.

A number of organizations have undertaken the implementation of ambitious information and communications technology (ICT) strategies. There are so many diverse situations in place that any new IS will be complex. Your organization will probably have a whole collection of legacy systems in place. When you develop a new system do you link it to these systems or do you scrap your existing systems?

Increasing numbers of organizations are implementing enterprise-wide information systems. All the different modules are dependent on each other for success. This need for 'totally' integrated IS requires many different groups working together to develop new systems. This often means groups of staff communicating together for the first time. Generally enterprise-wide information system developments are major undertakings for organizations. They will take up significant resources over a long period of time. Firms may need to have a significant internal information systems resource capability before they undertake such a major change process (Karimi et al. 2007).

Each staff grouping has its own aims and objectives as well as a defined set of priorities. They will each have their own special information requirements. The ICT that is implemented is also changing rapidly. Different firms may decide on different technology platforms. What is at the 'frontier of new technology' in 2005 can be redundant the following year.

It is within this dynamic, turbulent, and complex environment that many organizations have attempted to undertake major system changes. Most of the system development and project management methodologies that are being used have only proved themselves in static environments. The larger and more complex the system development - the longer the project takes. The longer the project takes the more chance that the business environment will change. The environment must be constantly monitored so that systems are not implemented which are already ineffective.

REQUIREMENTS

One basic requirement is that systems should be desirable and feasible. This could be extended to:

- *Desirable*
- *Feasible*
- *Relevant at implementation*
- *Maintainable over a defined period of time*

What are some of the key issues we should concentrate on to try and improve our relationship with the business environment? The following workshop may give you some ideas that you could use in advance of designing an information system that interfaces with the business environment.

Workshop

This workshop identifies a number of key criteria that managers and information systems staff should incorporate into any system development to provide the best possible safeguards against any changes in the business environment that might render parts of the system redundant. Team workshops will be introduced to identify potential future system needs. It is anticipated that users, systems staff, managers and trainers will be involved in these workshops.

It will be for the benefit of all concerned if any potential problems with information systems being developed can be identified before the design stage is reached. By adopting the previously identified team approach to the system development it is hoped that the staff's specific aspirations from a new system can be identified clearly in advance of any implementation.

This particular workshop should be held well in advance of any proposed system development.

It is a team workshop as a team approach is necessary, i.e. managers, users, trainers and IS staff working together to ensure that valid systems are introduced into the organization. It is hoped that this team approach will ensure that sufficient flexibility is built into new systems so that they are effective several years after implementation. This will hopefully lead to accurate information being provided even in a dynamic business environment.

The current situation—a shortage of skilled information systems staff within most organizations—will mean the demand for system developments will always outweigh its supply. Most organizations experience an IS development backlog. This situation may require different approaches to be considered.

One approach worth considering is an adaptation of the so-called 80/20 rule (Pareto). By identifying that 80% of your system needs can be produced with only 20% of your resources 'spare' capacity will become available if the environment changes and one finds that the needs of the business dramatically change and render some of your systems redundant.

One common mistake during system development is to computerise a bad manual system. If the traditional system development methodology is used, its limitations should be identified and discussed within the workshop, i.e. the time needed to develop a system through the whole life cycle is often lengthy and prolonged. This is why increasing numbers of firms are turning to rapid applications development (RAD) and the 'fast-tracking' of information system.

The more time that is spent developing parts of the system that are 'nice to have' but not necessarily 'crucial' to the department or unit, the more chance there will be that the environment will change and render the system redundant. If the system development life cycle approach is adopted, its potential inflexibility should be explained to the group. In a number of instances systems have been developed to completion even though major environmental changes have taken place.

Next Session

The participants will be split up into departmental groups with one facilitator/trainer in each group.

The agenda must be clear and understood by each member of each group.

1. We are not going to develop a system that we may have been using for several years.
2. We are not even going to develop a system that we would want to use today.
3. We are going to try and think of what our system needs will be in two or three years time.

This will be a difficult session to facilitate. It will be necessary to ensure that sub-departmental objectives do not conflict with the wider objectives of the department or the organization.

It can be argued that the facilitators will need to have a good understanding of the business objectives of the department/organization. This vision will take time to acquire and the training of facilitators/trainers before the workshop will be crucial to its success. One possible way to overcome this problem would be to involve all facilitators in an information requirements analysis exercise.

Once the groups have a focus on the future needs of their business they can consider the main issues of system development. The new information systems will only be effective if staff have the skills and competences to use them:

Impedlments in Information System Development

1. What skill level will be needed by existing personnel when the system goes live?
2. What training will be needed between now and implementation to ensure the system is a success?
3. What impact will the introduction of the new system have on the organization?
4. What will be the problems of implementing the system in two or three years time?
5. What technology may be required to run the agreed system in the future? (A very difficult question to answer as very often thinking on this issue is constrained by existing hardware. Resources will no doubt be scarce but there is no point in using existing technology that will lead to an ineffective system being implemented. The success of the whole system may depend on there being a user-friendly interface).
6. What benefits will accrue from this system? (It is very likely that the answers to this question will vary widely between the different groups. Benefits will only materialise if the system can meet the changing requirements of the environment in three or four year's time. If the groups struggle with this question then further questions should be asked about the proposed system).

It is hoped that a number of issues surrounding the development of information systems in competitive business environments will be addressed. Increased user involvement should lead to a more effective design of the information systems. Your staff should have a shared vision of how they will collect that crucial information and intelligence from the business environment. They will also be able to discuss the reasons why a flexible design will be crucial so as to make the information system effective for several years in the future. Even going through the process should make these staff more productive in this arena in future workshops.

Another area of genuine concern – and one that is not generally given enough prominence is that of data accuracy. Many organizations do not spend enough time

Exhibit 10.1.

Mini Case: Upscalling of IT Skills

I.T. suppliers, skills bodies and academics have gained European Commission backing to develop I.T. skills best practices across Europe, generate more investment in workforce skills, and combat digital illiteracy in Europe. Members of the new e-Skills Industry Leadership Board include Cisco, Microsoft, Oracle and a number of skills and training organisations such as I.T. trade association CompTIA, and EXIN, a global I.T. examination provider.

The e-Skills Leadership Board has agreed on four objectives. These include inspiring e-skills learning in future generations; promoting I.T. practitioner education, competencies and training; and boosting the employability of the workforce with I.T. user skills, including the deployment of multi-stakeholder partnerships.

According to European Union statistics body Eurostat, there is an annual shortfall of 100,000 European I.T. graduates, compared to the industry demand

and resources ensuring_that their store of data is accurate. We have already seen that an organization's survival may depend on accurate information. The following section puts some of these issues into a sharp focus as business environments become more competitive.

Data Input Procedures

The output from an information system (IS) is only as good as the data that goes into it. Managers will only be confident of making decisions when the information on which they are basing those decisions is accurate. Accuracy is, however, only one of the many qualities of information.

Different staff who have different priorities in terms of their information needs. Any member of staff that comes into contact with any information system, both directly or indirectly, has some responsibility for ensuring that the system and its output are accurate and up to date.

Exhibit 10.2.

Mini Case: Business Link London

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Business Link for London, the government support service for SMEs, has spent the last two years reducing duplicate data in its database from 25% to 2.5%.

The organization said this has boosted efficiency and estimated a saving of over £100,000 in that period by avoiding duplicate mailings to companies on its mailing list or to non-existent company addresses.

Business Link (BL) for London is the product of a 2001 merger of nine organizations. When it was formed, individual databases from each group were merged into a single repository to enable end-users to see the same information they had accessed when they worked for independent organizations.

The data integrity manager (DIM) at BL faced the challenge that while everyone could see their data, there were multiple records for many companies. Problems were compounded by the decision in 2004 to put all the data into a brand new Peoplesoft customer relationship management (CRM) system. Most organizations merge or delete records when faced with duplicate data - this strategy was not practical for BL.

"A common problem is that people delete records and realise they made a mistake ... and it is difficult to put the data back" (DIM). "BL dumped data into the CRM system without regard to duplication".

It then used the Firstlogic de-duplication tool from Business Objects to identify that 25% of the data in the Peoplesoft CRM entailed duplicate records. The DIM used the tool to create a 'master-subordinate' process where a user identifies one main record in a duplicate set as the master, with all other duplicates deemed subordinate.

The benefit of this approach is that the subordinate records are filtered out but can still be accessed if necessary. Through this data cleansing strategy the DIM hopes to bring down the rate of duplicate record to 0.5%, as users identify new master records from duplicate sets.

Exhibit 10.3.

Mini Case: Online Gambling

Online gambling firm Betfair is investing in automated debugging software in 2007 to speed up in-house system development and control the quality of outsourced code. The company, which plans to use Fortify's Source Code Analysis (SCA) to check code against a list of known software errors, expects the project to pay for itself in three years. Betfair has 100 in-house programmers who look after about 1,000,000 lines of code, plus about 15 outsourced coders on call during busy periods. The team constantly seek to improve system uptime and cut the time it takes to process a bet.

There is a need to produce an environment where systems staff, users and management view the quality of data input as a joint responsibility. This may usefully entail a workshop session where this team approach can be fostered.

IS does not automatically produce output that is correct. If erroneous data enters the system we get the situation popularly known as 'garbage in- garbage out' - producing the acronym *gigo* - well known in the information systems field. Staff within most organizations are well aware of the problems that can be caused by having to make important decisions without knowing whether the data on which they are based is correct or not. If a computer report lands on a manager's desk with much of the data being out of date any confidence that may have existed with the system could soon evaporate. In that situation staff will go looking for information from other sources.

Does the fault lie with any particular individual or group of individuals? The answer could be that anyone who comes into contact with the system, both directly and indirectly, has some responsibility in ensuring that IS and its output are accurate and up-to-date.

There are many views of what constitutes a successful IS. Information systems staff, managers, users and trainers may all have different views on what will emanate from an effective system. If the data within the system is not updated as changes take place then the output from it may be irrelevant. It is the duty of IS staff, users and management to put procedures in place that will ensure a system remains effective. Some of these procedures will occur when the IS is being developed and others when the system has been implemented.

There are ways that can be devised to verify and validate data entering a system. Computers will not, however, automatically identify incorrect input that is entering a system. It is very rare that any way can be found of ensuring that erroneous data does not enter a system. Incorrect data will inevitably enter computer databases but every effort must be made to ensure that the errors are kept to a minimum.

The following checklist might help you isolate certain problems that can occur when data integrity is not seen as an important issue for the organization.

Data Input Checklist

1. Do you derive any useful data from the systems you use?
2. Do you employ any system maintenance procedures?
3. Do you have any system evaluation and review Procedures in place?
4. Who takes responsibility for data accuracy in your department?
5. Do you have a database/systems administrator?
6. Do you think your existing information systems are flexible?
7. Do you think the information systems in your department produce accurate information?
8. Do your staff understand the problems of data? Overload?
9. Do you have too much or too little information available for decision-making?
10. Is *data* or *information* output from your present Information systems?
11. Is the output from your information systems in the right format for users?
12. Can it be used for decision- making?
13. How do you capture data from the environment?
14. Are there different ways you can capture data from your business environment?
15. Do you know how long the data you capture will remain relevant for decision-making?

16. Are your competitors collecting the same data that you are collecting?

17. What other areas of your business environment can you explore to try and capture crucial information for decision-making?

18. Do you know whether it is cost-effective to collect the data/information you are currently gathering?

Trying to address the above questions should lead to a team approach in a very important area. These questions are becoming more and more relevant even for small organizations. A market researcher could buy a computer and software for $1,000 and collect strategic data for organizations. He or she could add value to collected data, turn it into crucial strategic information, sell it on, and make a healthy profit. It is highly likely that this individual will also have systems that are much more flexible than the large organizations! Question 18 has to be asked as it would not be worthwhile to collect data that was not cost-effective for the organization.

Change Over

Changeover. can be defined as moving from the old information system to the new information system. Choosing the method to be used for changing from the old

Figure 10.1. Changeover issues

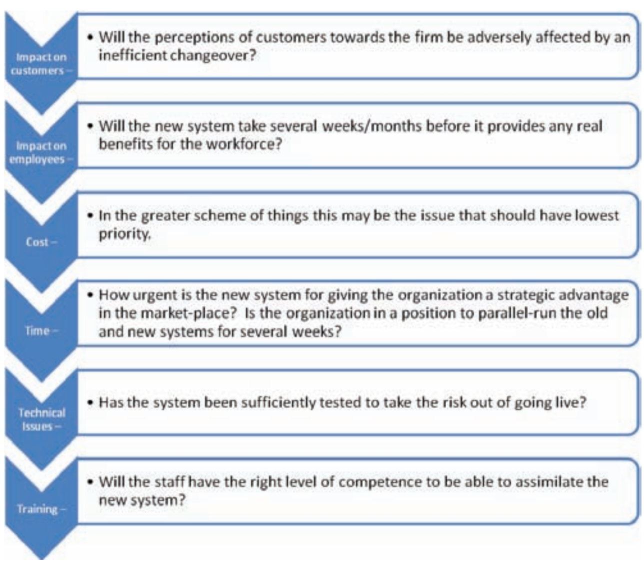

Exhibit 10.4.

Mini Case: Single Payment Scheme

Inadequate testing of computer systems has been a key factor in on-going delays in paying European Union (EU) subsidies to U.K. farmers, the Public Accounts Committee reported in 2007. The Rural Payments Agency was charged with paying out £1,500,000,000 under the Single Payment Scheme that was set up in 2005 to consolidate 11 EU subsidies. It missed the February 2006 payment deadline and continues to be plagued by delays, with £17 million still outstanding. In a report to the U.K. Parliament on the delays the PAC cited a failure to test computer systems "completely and adequately" as one of 15 reasons why the Rural Payments Agency had not met its implementation deadlines. The report said the Rural Payments Agency (RPA) had tested each element of the I.T. system in isolation, but it did not fully simulate the real-world environment. It said time pressure had also led to the RPA accepting I.T. components before they had been fully tested.

system to the new is one of the most important decisions that the project management team must make during the implementation phase. The factors that should be considered when deciding on which changeover strategy to adopt are shown in Figure 10.1.

It is generally accepted that there are four main changeover techniques:

1. **Parallel.Running**: With this approach the old and new systems are run side by side until the firm is confident that the new system will perform without any unexpected flaws.
2. **Immediate.Changeover**: This is sometimes referred to as the big-bang approach. With this technique a date is decided upon for the new system to replace the old. This is obviously a high-risk strategy. The firm may decide to stop using the old system on a Friday afternoon and to start using the new system on a Monday morning. It calls for stringent monitoring of input and output data once the new system has gone live. It can only work if thorough testing of the new system has been undertaken.
3. **Pilot.System**: An organization may decide to implement the new system department by department or branch by branch. This should take some of the risk out of the process. The firm should be able to learn a lot from the early implementations. It is hoped that the firm will become more and more proficient at going live with the various departments/branches.

Exhibit 10.5.

Mini Case: Department of Works and Pensions

A Routine software upgrade at the Department of Works and Pensions (DWP - United Kingdom) left 80% of the DWP's staff unable to send or receive e-mails. The company tried to put in place its Business Continuity plans. The affected systems are operated by outsourcer Electronic Data Systems (EDS) & Microsoft. EDS is also responsible for the Child Support Agency's computer system. It is interesting to note that the DWP spent £ 412,500,000 on consultancy fees in the last financial year for external management & technical support.

Exhibit 10.6.

Mini Case: U.K.'s National Programme for Health

Many issues surrounding maintenance are linked to the accuracy of data within the database or data warehouse. An important part of any new implementation is the transfer of data from the old system to the new system. In some cases this could mean moving from a paper-based system to a computerized one. This issue was recently highlighted during the development of the U.K.'s National Programme for Health (a major project that is being developed by the National Health Service).

Some paper-based records written by hospital consultants are unstructured or written on the equivalent of Post-it notes that cannot be reliably transferred into electronic records unless doctors oversee the process. It is quite obvious they do not have the time to do this as they have other priorities. It could be a major risk to patient health if an allergy is not recorded.

One of the major suppliers has withdrawn from the project because they concluded that the requirement for consistency of patient data was an unquantifiable risk. This is an interesting issue as the National Programme has always argued that electronic records will be more accurate than paper-based records.

It has often been said that information is the lifeblood of the organization. It is hard to imagine any organization in today's global economy surviving without accurate information. If you are currently using information from your IS for decision-making then system maintenance is crucial to your firm. You cannot allow these information systems to go into decline. The following workshop highlights some of these important issues.

4. **<u>Phased.Implementation</u>**: In many instances a firm may develop or purchase information systems with many modules. A good example of this would be the Enterprise Resource Planning systems that are composed of a suite of modules. The firm may decide to implement the modules in stages. Once they feel that a particular module is working effectively within the organization they can then start planning for the implementation of another module(s).

Impediments to ICT Implementation: Problems and Solutions – A Case of ERP and ERPLL

The Gartner Research Group (Zrimsek, 2003) credited with 'inventing' the extra-enterprise notion of **<u>ERP.II.</u>**proposes vast changes in how a firm is likely to perceive itself in the future. Essentially, they suggest that if a firm, at the basic degree of abstraction, feels that it is a provider of goods and services then it needs to revise this thinking somewhat. It needs to understand that the supply-chain in totality is that provider of goods and services but more importantly it is the creator of customer experience. They further suggest that the future will see a firm being increasingly core-competence driven with increasing divestment of non-core activities. This would lead to a heightened supply-chain, with a multitude of firms 'completing' the competence to provide the aforementioned goods and services. They further propose that in this heightened environment of business distribution, the core drivers for advantage would be a heightened customer experience and product/service improvement (Zrimsek, 2003; GRG, 2000).

In this light, the GRG proposes an information system policy that not only improves the operational and strategic capabilities of the firm but also improves the ability of the supply-chain to deliver faster and better. The former is done with the aid of intra-firm tools such as ERP, performance management, lifecycle management, knowledge management and so on (Koh & Saad, 2006). The later is carried out with the aid of 'external' tools as SCM, supplier/customer relationship management, and through initiatives that promote internet based collaborative commerce (Loh et al, 2006). This would facilitate the entire supply-chain in opening its proverbial doors not only amongst its own members but ultimately to the end consumers as well. Two ends have always to be kept in mind while strategising – to innovate whilst keeping the costs down and the customer experience high. This information improvement, exchange and consolidation policy, under the core-competence based outlook of the firm as an extended enterprise, a performance-based enterprise and a real-time enterprise, is what the GRG proposes under the ERP II umbrella (Wheller, 2004; Zrimsek, 2003; Zrimsek, 2002).

The GRG (Zrimsek, 2003) proposes the urgency of implementation and the likelihood of implementations starting in the very near future. This gives relatively less time for a multitude of involved stakeholders to discuss and reconcile on a range of issues. One way of going ahead could be to concentrate on the benefits/impediments issue with an aim to enhance the realisable benefits of ERP II and minimising the anticipated problems in adoption. At the same time, these could dictate building the operational considerations for implementation (i.e. issues of collaboration, inter supply-chain coordination, technology considerations etc.).

Thus, Koh et al (2007)'s research set out to achieve a preliminary set of issues—benefits of, and, impediments to success, of this 'new' set of management tools—ERP II, with a view that future deliberations on the issue of ERP II would be aided (and possibly guided) as mentioned, by the findings. It further set out to subscribe collaborative structure types suitable for information exchange that collaborative commerce would require – one of the important operational considerations as elucidated earlier. From the results and 'extra' inputs, it can be concluded that this research has succeeded in building and testing a comprehensive list of benefits/impediments, besides proposing appropriate collaborative structures which were its principal aims. It has further been successful in articulating future collaborative trends and directions for future research for ERP II. The results of the survey and the subsequent statistical analysis conducted are summarised thus:

1. Nearly 94% of the surveyed population responded in the affirmative over ongoing/future collaborations with their partners to aid on-line commerce.
2. The benefits and impediments of ERP as mentioned in the literature can be carried forward for ERP II, and while benefits increase more in intensity than in number, impediments increase both in number as well as in intensity. The findings seem to agree with some of the preliminary 'warnings' that early authors of industry houses (e.g. Wheller, 2004; Farver, 2004) have made.
3. 'New' benefits and impediments can be ascertained through causal (cause and effect) interpretations of postulations of ERP II involvement/allied fields in the literature.
4. Both benefits and impediments are not taken as 'objective' facts but vary in degree of acceptance between three stakeholder groups – the implementers, the functional (parent) users, and the suppliers (confirmed by the ANOVA/Welch tests carried out for the various sub-questions in the survey). The implementers i.e. consultants/IT companies who aid others in implementation, are found to be the most optimistic in accepting or agreeing with most of the benefits postulated and remaining confident about handling the posed impediments. The functional users of ERP are more pragmatic in cautiously agreeing with the benefits, at the same time showing concern in the impediments listed. The

suppliers i.e. the firms dealing principally in the B2B domain and generally ascribing to 2-3 major players in their supply-chains, appear the most pessimistic in remaining either negative or at best neutral over the benefits, and showing grave concern over the posed impediments. This finding is in definite agreement with that of Leon (2003) who found a similar trend in differential perceptions for ERP.

5. A number of other 'preliminary' issues are raised – concerns of dominant power-play and soft coercion; suggestions to vendors to keep their offerings industry and localisation specific and to avoid of large scale implementations; concerns over heightened implications of change management; observations of getting preferential treatment by larger companies if the systems are 'talking'; issues of the first-mover being an advantage or disadvantage; concerns over ERP II actually leading to a hypercompetitive state; unclear **ROI**; quantification of benefits; issues in multiple supply-chains; technical and infrastructural issues; and steps at formalisation of collaboration. These are issues and concerns for future research as none of them have been covered in the literature specific for ERP II.

The last issue i.e. on how to formalise the collaborative structures for ERP II has also been discussed through a short content analysis. Three structure types have been short-listed as joint venture, networks and Japanese style 'Purchasing Partnership'.

The research conducted is a preliminary investigation in areas of concern of an emerging concept. There neither exist a wealth of knowledge in the specific area to draw upon, nor actual situations to infer from. Therefore, this research had to 'test' theorised cause and effect relationships (carried out using limited 'anecdotal' topic- specific literature) with perceptions of stakeholders and 'experts'. The newness of the issue unfortunately also meant that the 'experts' are (in all probability) still in the process of 'developing' their perceptions. Thus, it cannot be confirmed to a degree of absolution if the reported perceptions would not change over time or even if the tested list of benefits/impediments is complete in itself. More involving methods such as semi-structured interviews could have possibly resulted in a 'richer' result set which could *then* have been surveyed for statistical rigour rather than relying on a set of considerations built through an extension of literature on ERP and through theorised cause and effect relationships only. This limitation was made clear in the rich data set recorded through the one open-ended question on the perceptions of ERP II in entirety. Completely open-ended interviews were piloted but were quickly rejected because of poor response rate and quality.

The sample obtained was also not homogeneous in its uniform distribution across stakeholder groups. This limitation was however 'statistically' managed by using the Welch test that takes into account this limitation.

There was a limitation in the way the impediments issue was handled. Although these were listed under logical headings (Strategic, Operational etc), these could be more meaningful if they were described implementation stage-wise. It is left as a research concern for academics and vendors to formalise how different ERP II implementation stages are compared to those for ERP.

There are two basic sets of recommendations that emanate from this research, suggested for the intervening period before full blown ERP II adoptions are seen:

First, for all stakeholders to 'objectively' use the findings of the research and design their product/service offerings (in the case of implementers), or strategise their future implementations (in the case of suppliers/users), in accordance with the benefits/impediments established. Scenario building (Johnson & Scholes, 2003), e.g. is a method that is used for long-term strategic planning. Now if one of the perceived benefits of ERP II established in this research lies in extending the value-chain, scenarios could be built (by functional users and consultants) to simulate and quantify how this could be applicable for the firm and its (increased) value-chain. This benefit scenario if extended for the 'partners' and logically coupled with other benefit/impediments scenarios could then serve to provide a quantitative enough vision (i.e. a tentative ROI) to pursue or decline.

This might appear rather abstract, but it should be remembered that this is only one-way of going forward. The important thing always is to calculate clear returns through a careful analysis of the benefits/impediments specific to the localised industry sector operated in. The GRG (Zrimsek, 2003) confirms this by adding that acceptable ROI once established should be the single driver to aid acceptance or decline. Unfortunately, calculating ROI in this setting will not be an easy task (which was difficult enough as it is for ERP (Wallace & Kremzar, 2001)) and would require clarity on a multitude of issues that originate from this research.

FUTURE TRENDS AND CONCLUSION

Effective education and training of staff are major cornerstones to the successful implementation of ICT. It would be futile to implement new ICT if staff were not able to realise its full potential. Recent feedback from enterprise resource planning (ERP) implementations has shown that a high percentage of overall costs are spent on consultancy support. In future, those organizations that view ICT development as an investment, rather than a cost, will be winners in the 21st century global business environment.

Recognising the impediments of successful ICT implementation is crucial in determining a realistic expectation from the systems. Hence, further research of the following issues would help mitigating some of the impediments (Koh et al, 2007).

1. Detailed analysis on how the perceived benefits could be realised and impediments could be mitigated (e.g. through scenario analysis) for specific industry sectors.
2. Complete the picture of ERP II involvement by again giving industry specific examples. This could cover the possible implementation steps for ERP II (to see how these differ from ERP)
3. What is the role of coercion and power-play in convincing partners to join in/who takes the initiative.
4. Is the first mover an advantage or disadvantage for ERP II (for ERP the first-mover was generally (not always) a disadvantage as lessons could be learnt from competitors mistakes). It might not be as clear for ERP II since the first mover might drive a potential partner to collaborate in an integrated supply-chain.
5. How do existing implementers (of ERP) prepare technically/how should the information system be architected.
6. Do suppliers/partners incorporating IT systems that talk with dominant players in the supply chain get preferential 'treatment' from these dominant players
7. Will ERP II lead to hypercompetitive states (this was pointed to by one of the respondents)
8. Can a parallel be drawn between what ERP II implies and the existing Keiretsu structures of Japan (If so, a lot of experience gained and published therein could be extended for ERP II)
9. Establishing a methodology for calculating ROI for ERP II
10. Identifying the critical success factors for ERP II. This would be different from existing ERP studies in that they would have to be written from a multitude of contexts.
11. Finally, once some empirical evidence is available, it could be found which success bracket does ERP II fall in – competitive disadvantage/parity/advantage or even sustainable competitive advantage.

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Chapter XI
Learning from Failures

To prevent failures, the scope of the project has to be manageable and projects need to be properly evaluated and reviewed (Maguire 2007).

STRATEGIC FAILURES

Introduction

Strategic.failures can be defined as failures of achieving the expected benefits from the organizational, size and industrial sectors or countries' perspectives at a higher level.

At an organizational level, such failures could be related to a scenario where the ICT implementation has failed to enhance an enterprise's image and recognition in the specific industry. From the angle of size and industrial sectors, such failures could be related to a phenomenon where 'sectorial divide' is apparent owing to the different stages of ICT adoption and hence affecting the possibility of integrating with suppliers and customers in a supply chain. Strategic failures can also be extended to failures at the countries level.

It must be noted that ICT adoption and implementation go hand-in-hand in the sense that successful past implementation will increase adoption (Gunasekaran et al, 2006). Government policy plays a critical role in determining ICT growth, adoption and implementation for the country's economy, the industry sectors and ultimately the enterprises.

Measuring information systems success and failure is a very complex process. Academics have attempted to identify the key criteria that affect the successful implementation of information systems for over 30 years (Lucas 1978). One recent research project used six key dimensions: system quality, information quality, service quality, use, user satisfaction, and net benefits (Petter et al. 2008).

Factors Affecting Strategic Failures

Outsource manufacturing and/or service operations to developing/transitional countries have become a common strategy for many enterprises in the west. For examples, Morgan Stanley outsourced their call centre to India, and many Motorola's mobile phones' parts are made in Malaysia.

Exhibit 11.1.

Mini Case: Wal-Mart and P&G

Wal-Mart and P&G, are the two consumer packaged goods suppliers that have made supply chain a household word. Back in the 80s, retailer shared very little information with manufacturers. Then, they built a software system that hooked the USA's P&G up to the USA's Wal-Mart's distribution centers. When P&G's products run low at the distribution centers, the system sends an automatic alert to P&G to ship more products. In some cases, the system goes all the way to the individual Wal-Mart store. It lets P&G monitor the shelves through real-time satellite link-ups that send messages to the factory whenever a P&G item swoops past a scanner at the register. With this kind of real-time information, P&G knows when to make, ship and display more products at the Wal-Mart stores. It eliminates the need to keep products piled up in warehouses awaiting Wal-Mart's call.

Invoicing and payment happen automatically too. The SCM system saves P&G a significant amount of time, reduced inventory and lower order-processing costs that it can afford to give Wal-Mart "low, everyday prices" without putting itself out of business. However, the small suppliers, e.g. farmer who delivers fresh organic vegetables to Wal-Mart, may not have similar types of ICT systems for such transaction. This shows that ICT adoption is influenced by a 'sectorial divide'.

Exhibit 11.2.

Mini Case : ICT Infrastructure

An example of e-government failure is the case of India's Indira Gandhi Conservation Monitoring Centre. The centre was intended to be a national information provider based on a set of core environmental information systems. Despite more than a year of planning, analysis and design work, these information systems never became operational, and the whole initiative collapsed shortly afterwards.

In Africa, a set of touch-screen kiosks was created for remote rural communities in South Africa's North-West Province as a part of their e-government project. These were initially well received. However, the kiosks' lack of updated or local content and lack of interactivity led to disuse, and the kiosks were removed less than one year later.

Exhibit 11.3.

Mini Case: The Obafemi Awolowo University Teaching Hospital

Based in Ile-Ife, Nigeria implemented a computerised system for storing and reporting patient record data called MINPHIS (Made in Nigeria Primary Health care and Hospital Information System). The system has helped to improve the quality of patient data which, in turn, has been used through reporting to improve the quality of decision-making. This should have helped in planning, for example to understand which disease categories to priorities for attention, or to understand the availability and requirements for particular drugs. It should help in research, for example to identify trends in patient health and care. And it has been used in resource management decisions, by improving the understanding of indicators such as the number of consultations per day handled by medical professionals, the number of patients per ward, the number of professionals who fail to write discharge summaries for their patients, etc. The availability of such performance information should also have helped focus the minds of health professionals on their own performance. The levels of use and institutionalisation of the system are still somewhat limited. The latest evaluation reported that MINPHIS was under-utilised and was more like a 'status symbol' at the hospital.

Exhibit 11.4.

Mini Case: British Rail

British Rail's (out-sourced, e.g. www.thetrainline.com) on-line ticket booking and purchasing services managed to streamline order processing time and to some extent reduce queuing time at their stations, but the ordering system fails to go in tandem with their real-time train scheduling system. As a result, although the customers have the tickets in advance, the trains are never on time.

In some developing/transitional countries, the importance of ICT policies is understood at the highest political level (Ketidikis et al, 2007). Many developing/transitional countries face similar constraints that need to be considered when ICT policies are formulated. However, the effectiveness of an ICT policy in one country does not guarantee that the same recipe would work in another.

Understanding the factors that may result in strategic failures will be useful in evaluating whether ICT implementation in enterprises or in sister companies are worth pursuing, or e-business initiatives are to be considered with suppliers and/or customers in developing/transitional countries.

In many instances it is difficult to gain agreement of whether an information systems implementation has been successful or not! Very often this can be rather subjective and open to wide interpretation (Bartis & Mitev, 2008).

The list below shows the factors that may affect strategic failures of ICT implementation in developing/transitional countries.

(1) Weak ICT Infrastructure

The lack of computer and telecommunications infrastructure is a key problem in many developing/transitional countries (Ketikidis et al, 2007). National ICT policies therefore need to be very strong in this regard. A master infrastructure development plan can be supported by detailed policies for administrative sectors, geographic areas, types of service, types of educational institute, etc. Government involvement remains essential in the construction of the infrastructure in the foreseeable future in rural areas and remote locations. At present, only large cities are sufficiently attractive for private developers such as mobile phone and Internet service providers.

(2) ICT-related Goods and Services are Made Available on Suppliers' Terms and Low Per Capita Purchasing Power Does Not Allow Markets to Mature

The fact that low-cost computers - although technologically feasible - are not available is largely due to the rapid development of and trade in ICT components that are almost entirely supply-driven, taking into account the needs of only a minority of potential users.

Apart from the fact that the availability of more basic and therefore cheaper PCs would lead to more widespread access to ICT, "poor man's PCs" would be easier to use than those currently available; such PCs would have comparatively simple hardware and be equipped with reliable and small operating systems and software. Such a PC would be able to perform the most common tasks in the workplace, at school, and at home.

Basic information technology, such as personal computers, their peripherals and software are available in major cities of developing/transitional countries. However, low purchasing power keeps the number of vendors down. Government ICT policies can help the development of ICT markets by reducing red tape, reducing import taxes, and creating a favourable entrepreneurial environment.

(3) Telecommunications Monopolies still Exist

Telecommunications sectors in developing/transitional countries in the Asian and Pacific region are typically characterised by government monopolies. However, a fair degree of liberalization has been achieved in several domestic telecommunications markets, and private ISPs have become commonplace. Consequently, more countries are succeeding in eradicating waiting lists for telephone services.

The liberalisation of international telecommunications, however, is taking place painstakingly slowly, and retail prices do not reflect transmission costs. Governments do not want to sacrifice revenue from monopolies, and attempts to change the international accounting rate settlement system (which is an additional reason for the high price of international telephone calls) have not succeeded. National ICT policies cannot afford to ignore the fact that the need for low-cost telecommunications services in developing/transitional countries is higher than ever (Ketikidis et al, 2007).

(4) ICT Readiness Varies Signi.cantly between Government Departments

Departments and agencies operating in a traditionally ICT-intensive field are likely to be more advanced than others. Governments can raise the overall standards by identifying a coordinating agency to maintain information about government ICT development ventures. Another way to benefit from the heterogeneity is to develop and test pilot applications in the more advanced departments before releasing them for wider use within the government (Zahir et al, 2007). This phenomenon also explains why many e-government projects in developing/transitional countries fail.

(5) The Public Sector is A Significant Employer

The computerization of routine functions allows governments to reduce staff and to improve the quality of their services at the same time. The effectiveness of such moves is often moderated by inflexibilities in employment contracts that limit the scope for staff retrenchments.

(6) Management Structures and Styles Are Not Conducive

Most failures in ICT implementation are caused by poor planning and management and not by the lack of resources or wrong technology choices (Loh & Koh, 2004). Management of ICT projects is often made more difficult by overly hierarchical organization structures that are not conducive to innovative ideas. This can create a problem if the management remains unaware of the benefits that could be achieved through the application of ICT. National policies should emphasise the importance of involving senior executives in ICT development and implementation, and making them accountable for their enterprise's ICT-related performance.

(7) Governments Are Struggling to Find Money for Basic Public Services

Government budgets tend to be tight, especially in developing/transitional countries. This can create problems for rational ICT development and implementation, and hamper the ability to react quickly to new requirements or to buy the latest technology (Ketikidis et al, 2007; Zahir et al, 2007). In order to get value for money, ICT policies should require the specifications of systems developed or purchased to be reconfirmed by third-party experts before an order is placed.

(8) The Penetration and Influence of the Internet Are still Minimal

The Internet is changing the way in which data and information are collected and disseminated and how services are provided to clients. Thus, new systems should be developed with either immediate or future Internet connectivity in mind (Maguire et al, 2007).

(9) Governments Find it Difficult to Recruit and Retain Qualified ICT Staff

A key constraint for successful ICT implementation in developing/transitional countries is the shortage of human resources (Ketidikis et al, 2007; Zahir et al, 2007). Apart from a lack of qualified ICT-system personnel, there is often high turnover of such personnel, which can seriously affect systems development and daily operations. In general, the ICT skills of other related personnel are not very developed. These problems can lead to delayed and uncoordinated ICT development and implementation, and contribute to inadequate data security. ICT policies need to address human resource development needs in a broad educational context.

Operational Failures

Introduction

Operational.failures can be defined as failures of achieving the expected performances after ICT implementation from the organizational perspective at a lower level. Achieving success in implementation does not guarantee success in operation (Loh et al, 2006). Only successes in both implementation and operation can be regarded as sustainable success.

Causes of Operational Failures

An IT manager or someone who is/will responsible for ICT operation in an enterprise shall pay particular attention to the list below, which shows the causes of operational failures on ICT usage.

(1) Fragmented System, No Coordination

Mis-match between legacy system and new ICT system, lack of integration between modules within the system and/or between the systems, lack of data standardisation and clear procedure in report generation, the absence of a clear boundary on the use of the system will cause inconsistency and ambiguity of users' responsibilities, and repeated data entry invokes human error (Loh and Koh, 2004; Yusuf et al, 2006; Koh et al, 2007).

Exhibit 11.5.

Mini Case: Tax Computerisation Project

The Tax Computerisation Project in Thailand's Revenue Department set out seven areas of taxation that were to be computerised. At the end of the project, only two areas had been partly computerised, and five other areas were not operational.

Cost overruns, glitches and other bumps hit during a USD50 million-plus rollout of SAP AG's ERP, CRM and other business applications in the city of Tacoma, Washington, USA, have generated a storm of bad press and end-user complaints, and a call from a city councillor for an audit to determine the causes of the problems. Some Tacoma administrators said they believe that overall, the year-old implementation of SAP R/3 has been successful, but they acknowledged that complaints about the system's payroll, billing, and budgeting and customer service performance have proved to be a thorny problem. Moreover, the city has had to pay nearly USD700,000 to Tacoma-based integrator TUI Consulting Inc. for unforeseen customization work.

(2) Shortage of Personnel

Some dedicated personnel are required from an enterprise to manage the ICT system (Loh & Koh, 2004; Loh et al, 2006). They are responsible for ensuring the system is functional, loaded with accurate data and updated. Management often overlook this requirement after implementation and hence resulting in shortage of personnel to manage the system and subsequently distributing such responsibility to the existing workload of employees without much regard to whether they are fit for this responsibility.

(3) Supply-Driven, instead of Demand-Driven

Supply-driven concept in ICT usage can be analogised as information overload. The system is capable of producing a wide range of information and report to various departments in an enterprise and to suppliers and customers. Not all of these information and reports are crucial in decision-making. Users could generate tonnes of irrelevant reports, where maybe only one or two that are really helpful. This is regarded as a cause of operational failure because employees are not using the resources effectively and efficiently through the support of ICT.

It is important to know where to look, what to look for and generate a precise report for that query in order to effectively assist decision making. Therefore, the information in the system should be selectively utilised and demand-driven.

(4) Too Much Bureaucracy

Typical organizational bureaucracy is not escapable even after the implementation of an ICT system. They tend to distract fluency of operations and delay processing time. The negative impact from this bureaucracy is often blamed at the system, e.g. infrastructure is not good enough to support the speed of decision making process required.

(5) Perverse Incentive

The benefits to users of the ICT system are unclear to the users. This will spark misunderstanding that could become significant especially when the new system is rolled-out and no employees are happy to use it and instead switch back to the old or manual system.

(6) Traditional Ways of Working and Organising

It is no doubt that there will be a cross-over between the traditional ways of working and organising, with the new (improved) ways of working and organising through the support of the ICT system (Azumah et al, 2005). However, due to the typical resistance of change from employees, the traditional ways of working and organising are usually preferred to be carried forward. Then, this will crash with the purpose of the ICT system, making it redundant and perceived to be inflexible and troublesome. Finally, this will result in operational failures because the intended functions of the ICT system are not fully utilised and hence expected performances, benefits and improvements are not realised.

(7) Outdated Hardware and Software

Ensuring the latest update and release of software, modules and functions in your ICT system is crucial so that the latest advance features can be used and its benefits exploited (Gunasekaran et al, 2006; Koh et al, 2006; Yusuf et al, 2006). Some systems design will halt if the latest patch file is not installed. These will breakdown the operational side of the system.

The most effective and optimum (near optimum) hardware should be in place to support the software. It is pointless to have an advance ICT system that runs in a slow PC and/or network.

(8) Lack of Data Warehousing Discipline

ICT system is data-dependent. Without data, it is a blank skeleton, just like a human being, without flesh and blood. Its operational is dependent on the availability of data. Its effectiveness is dependent on the accuracy of data. The enterprise must prepare to collect, store, feed and update the data in the ICT system.

e-Government

Introduction

It is not unusual that developed and industrialised countries are a step ahead on ICT development and implementation. An outcome from such initiatives is the e-government projects.

E-government is the use of ICT to improve the activities of public sector enterprises. Some definitions restrict e-government to Internet-enabled applications only, or only to interactions between government and outside groups. Here, we do not – all digital ICT are included; all public sector activities are included. Governments have been practising e-government for more than 50 years: using that first mainframe in the Statistics Office was “e-government”. We just didn’t give it that name 50 years ago. For examples, e-administration, e-citizens, e-services and e-society.

Not many e-government projects are regarded successful. This is another key type of strategic failures. Many developing/transitional countries are attempting to embark on the e-government paradigm without major fruitful outcome (Zahir et al, 2007). Survey and poll results produce the following working estimates about e-government initiatives in developing/transitional countries:

- 35% are total failures
- 50% are partial failures
- 15% are successes

The Potential Costs of e-Government Failure

A key problem among e-government practitioners is a lack of awareness of these costs (Zahir et al, 2007). Most costs are intangible, few are ever measured in the event of e-government failure, and e-government failures are often “hushed up”. This may explain why, despite the high costs of failure and the high prevalence of failure, many officials and politicians are still very keen on e-government.

- **Direct financial costs:** The money invested in equipment, consultants, new facilities, training programmes, etc.
- **Indirect financial costs:** The money invested in the time and effort of public servants involved.
- **Opportunity.costs:** The better ways in which that money could have been spent, if it wasn't spent on the e-government failure.
- **Political.costs:** The loss of 'face' and loss of image for individuals, organizations and nations involved in failure.
- **Beneficiary costs:** The loss of benefits that a successful e-government project would have brought.
- **Future.costs:.** An e-government failure increases the barriers for future e-government projects. It does this in two ways: (1) through loss of morale of stakeholders, particularly e-government champions, who may 'defect' to the private sector or overseas, and (2) through the loss of credibility and loss of trust in e-government as an approach to change. This increases risk aversion in some stakeholders, and provides support for others with vested interests in the status quo.

Learing by Examples

Why Learning?

Failure is the outcome of most ICT implementation projects. Why?

- Because Northern models are imposed on Southern realities
- Because private sector models are imposed on public/NGO sector realities
- Because "hard" models are imposed on "soft" realities

There is a critical mass of failures out there for us to learn and avoid to repeat the same mistakes again in the future.

The Potential Benefits of Learning from Failures

(1) Knowledge Generation 1: Application Learning

Failure can be a kind of very costly prototyping: filtering out unworkable ideas in the ICT implementation, and pointing the way for a better approach.

Exhibit 11.6.

Mini Case: Quaker Oats, Europe – ERP Deployment

Quaker Oats Europe took on the system, MFG/PRO from QAD, as part of a massive change management project, which followed the de-merger of Spillers Pet Foods from Quaker Oats. The company has subsequently moved from a USD7.1 million net loss in 1995 to a profit of USD8.3 million in 1997 – a financial turnaround of USD15 million in just two years. That success is based partly on the new and more efficient processes supported by its new IT.

Lessons: -

1. *In a period of change, it's more effective to get stable, reliable systems bedded in quickly, then re-visit them further down the line to extend functionality.*
2. *Business priorities change, so it's important not only to have IT systems that are flexible enough to support those changes, but also to keep looking at how IT can help to achieve the new goals of the enterprise.*

Exhibit 11.7.

Mini Case: Boeing – Theory of Constraints (TOC) Deployment

Aircraft manufacturer – Boeing, in Seattle, Washington, USA has used TOC at its PCB centre. They were taught the TOC Thinking Process by the Avraham Y. Goldratt (New Haven, Conn.). A three-year programme of DBR scheduling techniques implementation has resulted in scrap reduction from 35% to 3%, lead-time reduction of 75% and an increase of 100% throughput. Overall, the centre has gained significant improvement in on-time delivery of its products.

Lessons: -

1. *Rapid implementation does not guarantee performance. A thorough DBR implementation (in this case a good 3 years) gives outstanding performance.*
2. *They see this as an on-going improvement process. They will continue to use TOC as a means of continuous improvement.*
3. *Implementing any new system in an enterprise requires good educational foundation.*

(2) Knowledge Generation 2: ICT Learning

Failure can develop some valuable lessons about ICT implementation for those involved, e.g. that systems are not a magic wand to solve all government and enterprise problems.

(3) Knowledge Generation 3: Situational Learning

Whether a project succeeds or fails, the process of analysis and design can help those involved understand their organization's processes, structure and culture.

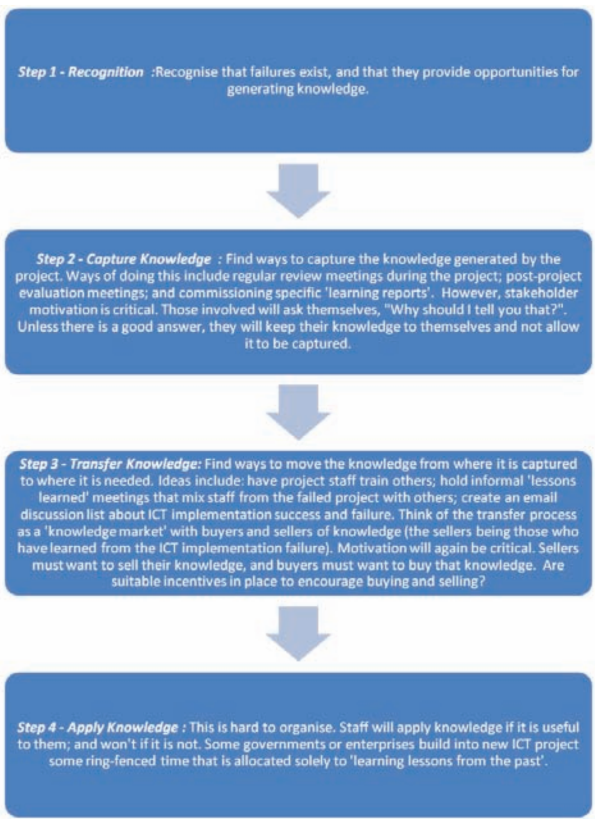
Ways for Effective Learning

A learning approach to ICT implementation, strategic and operational failures involves four steps as shown in Figure 11.1.

Fundamental Understanding

Prior to learning from ICT implementation, strategic and operational failures, it is important to understand the following fundamental principles:

Figure 11.1. Four steps in effective learning



- ICT systems are part of an enterprise infrastructure, and therefore are strategic to the enterprise's survival and success. If an enterprise does not consider IS as one of its critical success factors, chances are, the competition does.
- ICT systems are there to support business functions and increase productivity, not the reverse. The driver for an ICT implementation should be to increase an enterprise's competitiveness, not the adoption of a new religion that bends or distorts how an enterprise conducts its business.
- Learn from the successes and failures of others and don't attempt to reinvent the wheel of ICT implementation practice. There are time-proven approaches that can enhance the success of the ICT implementation.

Lessons Learnt

The lessons learnt from 30 years of experience in ICT development and implementation suggests the following in priority order:

(1) Sustainable ICT Development

The chosen ICT systems should have the potential to be upgraded to on-line ICT systems for future e-business potential. This implies that sustainable ICT development should be prioritised in order to avert ICT implementation (Koh & Saad, 2002), strategic and operational failures.

(2) Country Infrastructure or Localised Network Readiness

This depends on the geographical location of the enterprise. It is fundamental to investigate the country's ICT infrastructure, tax incentives, expertise availability, and efficiency of Internet network connection (e.g. broadband vs. dial-up) in the region and in the suppliers and customers sites, when evaluating the types of ICT systems to be implemented (Ketidikis et al, 2007). For example, Internet access in Bulgaria is very low as compared to other European countries and this makes it clear that the ICT chosen for enterprises in Bulgaria will be mainly for internal use. Such investigation is important because it may impact on ICT implementation, strategic and operational failures, if the wrong decision were made in the whole process of ICT development and implementation.

(3) Extensive Education and Training at all Levels

Provide adequate training for most employees, including upper and middle management. Provide education to all senior management. These will ensure better understanding of the concepts and principles of the ICT system, and help managers and users to relate and accept the change. This approach is expected to reduce ICT implementation, strategic and operational failures (Loh and Koh, 2004).

(4) Involve Local Communities and/or Users in Content Generation

To streamline the change and automation process, it is important to involve local communities and/or users in content generation for the ICT system. Since the ICT implementation will have direct impact on their activities and they experience the manual operations day in day out, this involvement is a recipe for success that cannot be ignored. In addition, they also want to feel that their views are valuable and their roles are not redundant after implementation. The implementation of ICT is to assist their operations and make them more efficient. This lesson is expected to decrease ICT implementation, strategic and operational failures.

(5) Get More than Adequate Resources

Provide more than adequate technical and administrative resources to allow employees breathing room (Koh & Saad, 2002). Perform cost/benefit analyses so that you know how much the entire implementation is going to cost and identify the results that will be achieved. This approach will help minimising ICT implementation, strategic and operational failures.

(6) Rehearsals

To prevent ICT implementation, strategic and operational failures, a number of scheduled rehearsals have been proven helpful in the transition to the fully new system. This concept equates to the parallel stage implementation approach rather than the big-bang approach. This provides training and learning, and hence less risky during the process of implementation.

(7) Involve the Local Bureaucracy and Organizational Culture

Local bureaucracy and organizational culture are the most difficult issues to deal with in ICT implementation from the angle of the implementer. From the angle of the management and users in the enterprise, they want to be involved and want their local bureaucracy and organizational culture to be adapted by the implementation of the ICT system.

Most enterprises think that their business is unique and the system should be configured to suit their business processes. Most of the successful ICT implementation adopts the standard implementation prior to customisation. This will allow the system to stabilise before any changes are introduced.

It must be noted that cultural change is impossible. Hence, adaptation is necessary in this case. Here we are referring to bureaucracy and cultural adaptations. To achieve this, early diagnosis of the business process of the enterprise is a pre-requisite. This diagnosis will provide a clearer framework on the extent of ICT adoption and implementation, and the change required and impact expected.

It is envisaged that this lesson will dampen ICT implementation and strategic failures.

(8) Need to Adapt Technology

Adaptation of technology to your system and enterprise is the crucial starting point to prevent ICT implementation and operational failures (Koh et al, 2007).

Such adaptation can be achieved via continuous learning and update of system, modules and functions; be aware and alert of the technological trend of ICT development in your industry sectors; and know what your suppliers, customers and competitors are doing.

To ease technology adaptation, the infrastructure and ICT system you choose or use has a critical influence (Loh et al, 2006). You don't want an incompatible system to the other systems you use, your suppliers use and/or your customers use. For example, if JAVA is used to support majority of your other systems, you may need to consider your new ICT system is JAVA-based so that systems integration is possible.

(9) Interactivity and Cross Communication

Communication breakdown is one of the biggest constraints of successful ICT implementation and adoption (Loh and Koh, 2004). Interactions and communications with all key actors and players including management, users, vendors, consultants, and implementers at key stages of implementations for progress reviews and performance evaluations are necessary.

Effective interactivity and communication can be achieved through simple actions, such as email alert, or more advance actions web conferencing. Personal review meetings, roundtable discussions and performance assessments are ways to bring key actors and players in the ICT implementation project together. These actions and activities can also be applied for post implementation or operational reviews and assessments.

This lesson is envisaged to help reducing ICT implementation and operational failures.

(10) Get Users to Buy-In

Get as many employees to participate heavily as practicable in accomplishing the functional requirements definition. The workers know their work and what they need to compress time. If they do not, use an outsider who does. Use a knowledgeable team to review and select packages. Get as many employees as practicable involved in the implementation phase. This will foster ownership and buy-in, and hence will prevent ICT implementation and operational failures.

(11) Use A Comprehensive and Systematic Approach

To avert ICT implementation failure, use a comprehensive and systematic master plan that addresses all parts of ICT implementation: development of IT strategy, requirements definition, review/selection of software, hardware, communications, unit testing, systems testing, conversion, resources, education/training, resistance to change, etc.

(12) Use Local Language

During ICT implementation, it is important to use the local language of the enterprise rather than the technical jargon of vendors and consultants.

(13) Support Online Activity with Effective Offline Components

For ICT systems that have modules connected on-line, it is vital that the on-line activity is supported by effective offline components. This is a low cost measure to ensure continuous services to customers even if the network connection is interrupted and particularly relevant in developing/transitional countries. Such measure would avoid strategic and operational failures.

TRAINING AND EDUCATION

Introduction

Training focuses on basic skills in a 'how to do it' orientation, whereas education emphasises an understanding of the functions in more of a 'why do we do it' and 'how does it work' concepts.

Training is aimed primarily at the actual day to day users. Training must provide the user with a familiarity with the day to day tasks that must be accomplished to keep the system functioning effectively. On the other hand, education should be targeted primarily at the supervisory and managerial levels to provide insight and information that will allow the student to effectively apply the functions provided by the system to the management of the enterprise.

Levels of Training and Education

The development, adoption and implementation of ICT systems need to be supported by effective training and **education** to the users and managers in the enterprise. Further research may be required to confirm a strong correlation between the effects of ICT training and successful implementation (Sharma and Yetton 2007). To achieve this, our 30 years of experiences in ICT suggested the following levels of training and education:

- Concepts
- Functional education
- User training

Exhibit 11.8.

Mini Case: Viking Range Corporation (USA)

Viking Range Corporation (USA) is a user of Oracle. Oracle University played an important role in providing on- and off-site training to Viking employees. They were very excited that Oracle was willing to provide training right in their offices. They find this approach much more valuable in increasing our knowledge base and improving our processes going forward. With assistance from Oracle, Viking succeeded in securing grants from the state of Mississippi and the federal government for ongoing job training for its employees. Soon Viking will be rolling out its direct-to-order Web site using Oracle Configurator and Oracle iStore, where customers will be able to customize and view products before they make a purchase.

According to the National Study for Usage of Information and Communication Technologies among Small and Medium-sized Enterprises in Bulgaria, done by JNN Consult, BARDA, BEF and EU Project, and was sponsored by IBM Bulgaria, SAP Bulgaria, Spectrum Net and Paraflow Communications, the 427 SMEs in Bulgaria interviewed showed that the investments in IT services, consulting and training still compose a small part of IT budgets of SMEs in Bulgaria but the trend is to dynamic increase. While in 2001 they compose 5% of IT budgets, in 2001 this percentage is more than 10%.

(1) Concepts

What? Concepts introduction could cover any combination of the following concepts depending on the types of ICT system introduced. Details of these systems can be found in Section III of this book.

- Enterprise Resource Planning (ERP)
- Supply Chain Management (SCM)
- Suppliers Relationship Management (SRM)
- Customers Relationship Management (CRM)
- Demand Chain Management (DCM)
- Materials Requirement Planning (MRP)
- Manufacturing Resource Planning (MRPII)
- Just In Time (JIT)
- Optimised Production Technology (OPT) or Theory of Constraints (TOC)
- Advanced Production Scheduling (APS)
- Electronic Data Interchange (EDI)
- Radio Frequency Identification (RFID)
- E-commerce
- E-business
- Knowledge Management System (KMS)

The impact of the ICT systems on the way the enterprise does business is the most important part in concept introduction. Typically the highest-level executives will not directly involve in the implementation except as string supporters, but they can unintentionally torpedo the system if they don't understand how it fits. For example, the impact of lead-time on delivery or the real purpose of a master schedule.

Why? A clear understanding to the concepts of the ICT system implemented will encourage management involvement, employee buy-in, cost-and-benefit analysis, and cause-and-effect of change, which will help better planning of the ICT implementation project by better inclusion of unexpected events.

Who? All employees should be introduced to the concepts, appropriate to their level of involvement in the system. At the higher management levels, conceptual education may be quite extensive. For employees at the lower level, introduction of such concepts can be carried out in a few hours of meeting or built in as part of their detailed training materials. For the middle management, such concepts introduction will fall somewhere in between.

When? At the early stages, introduction to the concepts of ICT will provide the perspective that is needed to accept and understand the details provided in the other two levels.

How? Concept (theory) education can be a program in itself and/or can be a part of more specific education and training programs. Generic concept programs are readily available live or on report or multi-media pack from industry consultants and/or vendors. Other sources of concept education are universities, professional institutions, or professional societies.

(2) Functional Education

What? Functional education must be designed specifically for the system being used. It is a level between concepts and hands-on training. For example, a functional class in inventory management will discuss the specific enterprise and capabilities of the system, and will probably include sample of screens and reports from the system. This class will explain how the function in the system works, describe how it fits in with other functions and systems, and give advice on effective set-up and use.

Why? A good functional education program will also include explanation on how these functions are applied to generate real business benefits. Functional education should put them in business context, including the procedures and disciplines that are necessary to ensure data integrity and timeliness, and how to use the system's functions to improve control and visibility of that area of business.

Who? Directors/managers and key users from the following departments (depending on the chosen functions, modules and systems): IT, Production, Manufacturing, Human Resource, Personnel, Accounting, Purchasing, Inventory, Warehouse, Logistics, Distribution, Sales, Marketing, and Service.

When? After concepts introduction and selection of ICT systems, directors/managers and direct users of the systems should be functionally educated according to the types of systems chosen.

How? A blend between hands-on and lecture-and-exercise approach is typical in delivering functional education. Both methods have their own merits and the enterprise must decide which is preferred for specified purposes.

In addition to scheduled classes, on-site programs (standard or customised) are available from vendors and consultants. An on-site class is more tailored to an individual enterprise's needs and settings, whereas a scheduled class cover diverse areas of interests of the group. Nevertheless, a scheduled class enables exchange of experiences with other enterprises. If there is a large number of employees to be sent to attend functional education courses, comparing with scheduled classes, on-site classes are usually more cost effective from the enterprise's point of view because they do not need to pay for sending employees (including basic registration fees; head-count fees; travel, accommodation and subsistence expenses) to attend the scheduled classes. They could be fitted in a room and on-site education will be much more beneficial. This is quite a typical scenario for larger enterprises. Interruption is a problem for on-site classes, and hence these classes can also be held in nearby hotel or conference room. As taking away a large number of main managers and employees from normal jobs for such education, a split program can also be arranged (same education materials repeated at various times). If only a small group of employees (say in smaller enterprises) need to be functionally educated, then attending scheduled classes will be more effective.

(3) User Training

What? User training must emphasise the 'how to' aspects of the system operations but should not completely exclude the 'why'. User training must include hands-on exercises if at all possible. Computer-assisted training and multi-media training facilities are sometimes available to play a role in this segment of your education plan. Your vendor may also provide some personalised hands-on training assistance at no additional cost as part of the installation support that they provide with your purchase of their ICT system. Capable and knowledgeable members of your own project team cam also become involved in the development and delivery of user-level training, especially with the help of train-the-trainer programs (sometimes called T3 programs) from the vendor.

Why? User training is the core necessity for operational performance of the ICT system. Introduction to the system should include enough concept and theory education so that they can fully understand their importance to the overall effort. They also must understand the 'why' as well as the 'how' to be effectively motivated to maintain procedural discipline and to resolve questions or difficulties. We must avoid the situation whereby the users are thought about 'which keys to press for what functions' rather than a deeper level of understanding of the reasons and impacts of those actions.

Who? Direct users from the following departments (depending on the chosen functions, modules and systems): IT, Production, Manufacturing, Human Resource, Personnel, Accounting, Purchasing, Inventory, Warehouse, Logistics, Distribution, Sales, Marketing, and Service.

When? After concepts introduction and selection of ICT systems, direct users of the systems should be trained on the use of the system. This will run in parallel to the functional education. At this stage, any problems or difficulties can be highlighted and should be resolved before the system goes live.

How? A shadow system where the users could experiment with the functions, modules and systems without disrupting and overwriting the live system; or a conference room pilot where a sample of system is set-up to test applicability and develop procedures prior to implementation.

Do's and Don'ts

Whatever training or education strategy you develop, be sure to keep these in mind:

1. *Users and managers may not be able to learn everything from the manual*
2. *Manage stakeholders' expectations*
3. *Include training and education costs in your budget*
4. *Involve all the appropriate people in your organization*
5. *Update your education and training continuously*

Why Do ICT Projects Go Wrong?

Introduction

It is extremely important that users feel that the system is theirs. Failure to involve staff during the stages of analysis and design can lead to major problems once the system goes live. The following showcase from 2004 identifies what can happen when the aforementioned does not take place.

Roles During Systems Analysis

It is often assumed that the information systems professionals specialists play the major role during the **systems.analysis** stage. It is true that they are expected to undertake the analysis of the proposed system. They will be expected to collect data and to document the findings. A full list of the duties of the systems analyst can be seen below. However, users can often play a very important role at this stage of the system development life-cycle. They can help in describing the existing system. They can even collect and analyse data. They are in a good position to know what strains will be put on the new system when it goes live. During certain parts of the day and week there may be extra throughput on the system. Management can champion a new system which may mean putting extra resources into the project where necessary.

The duties of the systems analyst are often wide-ranging:

1. Collect, record & analyse details of existing procedures and systems
2. Develop ideas for a system superior to the current one in use - improve system performance
3. Design input, file and output requirements.

Exhibit 11.9.

Mini Case: International Petroleum Exchange (IPE)

An electronic trading system set up by the International Petroleum Exchange (IPE) is still being ignored by users six months after it went live. The IPE revealed that only about 5% of total trades made on oil and natural gas futures contracts are being conducted using a browser-based version of the electronic trading system. This system is running in parallel with the traditional trading system.

The proportion of trades made electronically has risen only marginally from January 2004, when less than 3% of total trades were handled this way. The IPE, Europe's largest exchange for energy futures and options handles more than $2 billion (U.S.) of trades a day. This is happening even though the long-term aim was for all trading to be carried out electronically using the new system.

The new system has 350 registered users and the IPE is hoping to attract new traders from other exchanges. The advantages of the electronic trading system include allowing access to international trading markets, being able to automate the trading cycle – known as straight-through processing – and trading directly without the need for a broker. Overall, the main advantage of the new system is that processes are captured automatically so there is less chance of something going wrong in the trade cycle. It should also be easier to reconcile the various transactions that should help the important area of regulatory compliance.

This Mini Case highlights a common reason why ICT projects do not achieve their original targets – the failure to secure the support of end-users. One leading analyst made the comment that it seems an incredible waste of money for only 5% of trades to be undertaken electronically. Another spokesperson added that you have to force people to use electronic trading systems. This appears to go against the conventional wisdom in relation to obtaining user involvement in new systems.

4. Specify checks and controls to be incorporated in conjunction with audit staff.
5. Specify the most appropriate processing technique for the prevailing circumstances.
6. Define error messages and routines to be incorporated in the system.
7. Specify test data to be used for proving the system - in conjunction with users, audit and technical staff.
8. Arrange test runs in conjunction with users.
9. Monitor the results
10. Produce a system specification
11. Plan the changeover from the old to the new system.

12. Maintain the system so as to take account of changing circumstances.
13. Ensure there are good communications between users, management and technical staff.

Showcase of What Can Happen if Discrepancies Occur with the Systems Analysis Stage

One of the most important requirements of any new system development is that key users are involved at every stage of the project. A successful measure of any new system is that it will be used by the key stakeholders in crucial areas of their work. Dept. of Health officials in the United Kingdom have estimated the total implementation costs of the National Programme for I.T. at between £18.6 and £31 billion. However, there is a risk that the procurement will be largely wasted as the advanced systems will go largely unused by doctors and nurses. This could have been brought about by poor communications between management, technical staff and the clinicians.

There is real pressure on the system development team to produce an effective design for the new system. However what might be needed is a system specification that is as flexible as possible to cater for changing requirements. Great care is needed when drawing the boundary around the original system. If it is drawn too narrowly sub-optimisation may result. If it is drawn too widely the project may be too ambitious, complex, and time-consuming.

Users can play a major role during system design. They can help to design inputs, outputs and processing logic. This is especially true of screen design. If they are inputting data every day they are in the best position to identify the most efficient approach. They are also in a very good position to forecast the impact of the new system on staff. This could be a good way of identifying the possibility of resistance to change. Throughout the system development they should be kept informed of any changes to the design of the new system.

Through prototyping the requirements of the users should be high priority. Management should also view this stage as being high priority. They should also attend review meetings. They should be in a good position to plan for the implementation of the new system. What affect will the new system have on relationships with customers? If prototyping is viewed as important within the organization information systems staff should view system design as an iterative procedure.

At this stage it may be necessary to provide programming staff with specifications for the new system. In many small and medium-sized enterprises the systems analyst, systems designer, and programmer is the same person. The systems professional should be able to combine users' needs with the various technical requirements to develop detailed specifications. When changing from an old system to a new system it will be necessary to formulate a technical conversion plan. Data from one system will need to be efficiently transferred to the new system.

CRITICAL FAILURE FACTORS

It is not only ICT projects that have the propensity to go wrong. In the construction sector they have some very good examples of building projects that have taken much longer than anticipated and almost by definition they have gone way over budget, i.e. the Hollyroad project. The following is a list, not exhaustive, of why some ICT projects can fail to deliver expected benefits.

Exhibit 11.10.

Mini Case: U.K. Child Support Agency (CSA)

The U.K. Child Support Agency (CSA) and its main IT supplier EDS have been locked in a disagreement about whether the department is justified in withholding about $2 million a month in service payments. The agency has blamed EDS for computer problems that have dogged the U.K. government's plans to simplify the administration of payments made to and from parents. However, it has recently been disclosed that the department is seeking at least 2,500 changes to the design of systems that support the new "simplified" working processes of the CSA.

An independent expert described the level of unscheduled change requests as "extraordinarily high" even taking account the system's size and scale. He said this reflected badly on the planning for the project. The chief executive of the CSA said the agency had addressed cultural and business process issues around the new system but the "brutal fact is that the one component that did not work consistently was the IT".

EDS contends that it is not solely to blame for the non-availability of data. The processing of some cases has been held up by computer problems. However, thousands of cases have gone un-processed because of a lack of information in files, such as a failure to trace the whereabouts of the absent parent or the absence of a national insurance number. In response a spokesman for the agency said the department had consulted EDS extensively on the development of its requirements and in terms of the changes made the level has been within the normal range for systems within this size and complexity.

The CSA's system should have gone live in April 2002 but was delayed by a year because the department of Work and Pensions was unsure that the technology would support the agency's reforms.

Exhibit 11.11.

Mini Case: Avis Europe

Avis Europe has cancelled development of a new ERP system because of cost overruns and delays, and will also scale back its overall I.T. restructuring project. This is a £28 million project where Avis abandoned the system based on Peoplesoft software before it was rolled out. There were a number of fundamental problems with its design and implementation. "For the foreseeable future, our ERP project is over. It is now more important that all the various strands of Avis' I.T. systems are put in working order" (Avis October 2004).

Avis licensed the software in the first quarter of 2003; Atos Origin SA was in charge of the implementation; and had contracted PeopleSoft Global Services to configure and customise Peoplesoft's Financial Management Solutions Software. The ERP system had been expected to link core business processes and lift operating profit margins by 1%. The Avis Europe chief executive stated that, " We are very disappointed the project incurred significant exceptional costs and will not deliver the anticipated benefits".

1. Top managers not providing enough support & commitment.
2. Objectives of the change not clearly designed.
3. Line or functional managers not being sufficiently involved in the project.
4. Responsibilities for tasks not clearly defined & allocated to individuals.
5. Problems & changes ignored until too late.
6. Progress monitored in a haphazard way.
7. Corrective actions delayed or ignored.
8. The project group never really worked as a team.
9. Inadequate time & effort invested in planning.
10. Some key people who could make or break the project were left out of discussions.
11. Department or sectional interests took precedence over organizational needs.
12. Project leaders lacked the right mix of technical, business & interpersonal skills.

It may be a good idea to identify the practical issues that we should consider before trying to tackle ICT projects. However, we must remember that even by addressing these issues we will not be able to guarantee success:

- Recognise that organizational and people issues may be the barriers to success.

- If possible change the organization structure to capitalise on the strategic and competitive advantages offered by ICT.
- Appoint a user manager as project leader, not an ICT specialist.

Once a system goes live there is a strong likelihood that there will be errors within the system. The organization must have very good procedures in place so that it can detect errors at an early stage. A new information system is only as good as the accurate information it can provide for decision-making. If employees see that the new system is not delivering the level of accurate data they were anticipating it can have a serious detrimental effect on the success of the system. It can be argued that the success of a new system is purely down to its level of usage. If confidence is lost it may lead to staff looking for alternate sources of data/information or even reverting back to using the old system.

What Could Be Done To Prevent Failure?

The following action points were collected from the project on Select Committee on Public Accounts – First Report - Analysis of the Main Findings:

- The full implications of change should be identified, i.e. IT systems policy changes, demand for services.
- A structured business case must be formulated.

Exhibit 11.12.

Mini Case: ERP Software

Many firms worldwide have purchased enterprise resource planning (ERP) software. In so doing they are placing a great reliance on a set of well-established business processes. However, organizations must ensure that this is not putting them in the equivalent of a business straitjacket. They should ensure that the can evaluate and review their business processes on a regular basis.

It has been suggested that IT directors need to plan up to 20 years ahead to ensure a better return on investment from ERP. However, firms are hanging onto their ERP systems for twice as long before upgrading. Firms need a clear strategy on which business processes will be supported through ERP and what is out of its scope. It is recommended that firms should review the performance of ERP in monthly or quarterly meetings between business managers and the IT department.

Exhibit 11.13

Mini Case: Service Level Agreements (SLAs)

In a recent survey that questioned 1,000 organizations worldwide a significant proportion of firms are failing to put in place service level agreements (SLAs) for information technology (IT) systems. The survey examined the take-up of SLAs to measure processing performance, system availability when needed and restoration times following outages. Almost 60% of companies worldwide said they had introduced SLAs covering at least one of these areas with the United States having the highest use (70% of companies adopting SLAs).

Without adequate methods of measuring IT service levels, users are at high risk of their systems failing when under stress. In fact, the survey found that performance degradation had an impact on 93% of the UK organizations questioned, with 34% of companies reporting that systems had crashed as a result of heavy demands placed on them by end-users (n.b. this could be a direct result of a failure to undertake robust testing). None of the IT managers in UK firms responding to the survey said they were able to detect the initial stages of performance degradation 100% of the time. Some 32% admitted they only detected potential problems for 50% of the time or less, and 13% admitted to making no effort to detect performance degradation at all!

The survey also found that IT departments were struggling to stay one step ahead of degradation problems. In 68% of the IT departments surveyed, staff only learned of performance degradation when end-users notified them. Some 28% of those surveyed in the UK said they only became aware when the systems crashed! It is interesting to note that 25% of respondents said business managers had no input on SLAs. It is important that SLAs are flexible to cater for changing business requirements.

- Projects should not proceed without undertaking adequate **risk.analysis**.
- The scope of the project must be carefully assessed.
- Wherever possible projects should be broken down into shorter tranches.
- An expert team should remain in place after the system has been implemented.
- **Project.management** staff must have the necessary background and experience.
- Organizations should not engage consultants in a haphazard manner.
- Careful consideration should be given to the type of training available to staff using new systems.
- User requirements should be specified in as much detail as possible.

Exhibit 11.14.

Mini Case: Corporate IT Forum

The new chairperson of the Corporate IT Forum, representing 140 IT directors from Europe's largest firms, has called on software suppliers to improve the quality of patches and be held accountable for "sub-standard software". She said she would continue the campaign to improve software quality. She stated that users face larger overheads through constantly maintaining software and applying patches and service packs. A recurrent theme from the forum's members is that they do not trust patches to work without side effects or software suppliers to deliver something they can implement straightaway. She said that suppliers need to be called to account for producing sub-standard software.

- Long delays in implementation can lead to projects being overtaken by technological developments.
- **Contingency.plans**, i.e. not delivering on time. There is a need for back-up procedures.
- Understand potential impact of delay on the business & customers
- Assessment of potential compensation payments to customers
- The transfer of **business.risk**.
- What is the technical viability of the project?
- Clearly define the roles and responsibilities of the various stakeholders, i.e. sub-contractors. Who is managing the project?
- Stakeholders should understand the complexity of it.
- The commitment of users is crucial to the success of is/it projects.
- A danger of implementing projects too quickly and not adequately preparing sites.
- More involvement in the project management process.
- Phased introduction of systems vs. "big-bang" approach.
- Design flexible systems.
- Strategy should have clear objectives and milestones.
- Clarity as to how the projects fit together.
- **Independent.evaluation** and review is important.
- Risks of having tight timescales.
- Don't use failing systems just because lots of money has been spent on them.

- Remember that systems will have teething troubles.
- Contracts should be awarded on a fixed price basis.

FUTURE TRENDS AND CONCLUSION

The first issue for any organization to consider that there is no certainty that their ICT initiative will be successful. As with all projects the propensity to encounter problems with ICT projects is very high. There are many stakeholders involved in an ICT project and they often have disparate aims, objectives, and goals. Trying to reconcile these differing requirements is often a thankless task for the project manager. ICT itself is constantly being updated and this makes the development process even more complex. It resembles trying to hit a moving target.

Hopefully, in the future, we will be able to continually learn from previous projects and build up case material that will allow firms to understand how perilous this journey had been from an organizational perspective.

Little failure cases could be found from the literature because nobody wants to show their failures. This chapter valuably highlights examples of strategic and operational failures, both at e-government level of organizational levels. This provides a basis for future learning to avoid such costly mistakes. The critical failures factors discussed in this chapter could be used as a form of checklist to enable failure prevention exercise in any ICT project.

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Section III
ICT Challenges for the Future

Chapter XII
Drivers and Barriers for ICT Development

The Internet Cultural Era (ICE) has driven many Small and Medium sized Enterprises (SMEs) in the UK and Ghana to adopt ICT technology. This competition is particularly fierce in the logistic providers and tourism service industry. (Azumah et al, 2005)

The drivers for ICT development in Gripple (Sheffield) Ltd UK are to be able to improve the operating efficiency in administration, stock keeping and order received. They have a kind of ERP system to deal with production planning. They plan to be able to integrate their system with their suppliers. However, the barriers are that their suppliers are not ready and do not have the technology for integration. (Pavic et al, 2006)

CONTEXT OF ICT DEVELOPMENT

ICT has been adopted in manufacturing and service industries, public and private sectors, large organizations and SMEs, for productivity improvement, increased operational efficiency and better customer service. The historical nature of ICT development and implementation has always been made popular by larger organizations. This was the case due to financial support and complexity of its business processes. In smaller organizations, the adoption of ICT has begun to emerge over the last 15 or 20 years. Due to the advancement of IT and network technology, increasing number of SMES have begun to exploit the benefits of ICT. In addition, the globalization phenomenon has also driven many SMEs and large organizations to adopt and integrate the use of ICT in a supply chain.

ICT can be defined as the study of the technology used to handle information and aid communication. The phrase was introduced by Stevenson in his 1997 report to the UK government and promoted by the new National Curriculum documents for the UK in 2000 (FOLDOC, 2008).

ICT development deals with the design and implementation of information systems using information and communication technology. For examples, Enterprise Resource Planning (ERP) systems, Supply Chain Management (SCM) systems, Customer Relationships Management (CRM) systems.

DRIVER AND BARRIERS FOR ICT DEVELOPMENT

Various studies have been conducted examining the drivers and barriers for ICT development. Barriers can be defined as inhibitor factors exacerbating the effective and efficient development of ICT. Drivers can be defined as motivator factors leading the effective and efficient development of ICT. It is essential for an organization to understand the barriers and drivers for ICT development in order to maximise the chance of its success in development and implementation.

It is, however, necessary to recognize the generic and industry-specific barriers and drivers in this context. Such recognition provides a step ahead in ICT development planning by involving the right resources and personnel, and managing expectation of stakeholders in order to maximise the success rate of ICT development and implementation. In this chapter, the generic as well as the sectorial specific barriers and drivers, are summarised to provide its overview in diverse sectors.

The generic driver and barriers for ICT development (Pavic et al, 2006) were derived from a comprehensive literature review and interviews with managers. The manufacturing sectorial specific drivers and barriers for ICT development were derived from interviews with managers from manufacturing organizations in the UK. The service sectorial specific drivers and barriers for ICT development (Oldham, 2003) were derived from interviews with managers in service organizations. The learning and education sectorial specific drivers and barriers for ICT development were derived from the Queensland government, Australia, in 2002-2003. The agricultural sectorial specific drivers and barriers for ICT development (Sartain, 2003) were derived from a consultancy project in the agricultural sector.

In 1999, UK government had set an ambitious target to increase the use of ICT across the nation. One of the issues raised is to investigate the drives for changes in South West businesses. Although findings demonstrated that customers are the driving forces for ICT development, however the real motivation in reality comes from the stakeholder of the organization that include directors, internal users and the competitors. Therefore, ICT is seen as an enabler tool to reduce costs and im-

Figure 12.1. Generic driver and barriers for ICT development (Adapted from Pavic et al. 2006)

Drivers for ICT Development

- To improve business competitiveness (Chapman et al, 2000).
- Opportunity to try out new **e-business** models (Sadowski et al, 2002)
- Availability of better and faster communication and information channels, accessible global market (Chappell et al, 2002).
- Opportunities, based on cost, rather than for strategic reasons (Sadowski et al, 2002).
- As a company grows in size it becomes more difficult to communicate with its customers so that e-business and the internet become more important (Daniel and Myers, 2000; Actinic, 2002; UK Online, 2002).
- External pressures by new customers and their value proposition of 'what, when and how they want it, at the lowest cost' (Kalakota and Robinson, 2001).
- To enhance customer relationships (Daniel and Myers, 2000).

Barriers for ICT Development

- Lack of SME information pertinent to SMEs (Chappell et al, 2002).
- Mistrust of the IT industry (Van Akkeren and Cavaye, 1999).
- **E-technology** readiness and adoption vary by industry sector (Bodorick et al, 2002;Martin and Matlay, 2001).
- Limited resources in terms of time and effort to incorporate IT facilities (Chappell et al, 2002).
- The older the SME the less likely they were to use e-technology (Daniel and Myers, 2000; Simpson and Docherty, 2004).
- High running costs, lack of awareness of what e-technology involves, shortage of technological skills, insufficient knowledge and education, absence of help and time (Darch and Lucas, 2002).
- Perceived benefits by owner/managers in SMEs (Iacovou et al., 1995; Kirbi and Turner, 1993; Thong and Yap, 1995) – Owner/managers do not necessarily think that the Internet is a "good" thing.
- Most businesses prefer to use ICT to augment changes in how they connect with their customers and reduce costs through more efficient management of their internal processes (UK Online, 2002).
- Lack of education, IT skills and computer literacy as well as unwillingness of managers to be responsible for technological change (Kalakota and Robinson, 2001; Kirby and Turner, 1993; Thong and Yap, 1995; DTI, 2003; Local Future Group, 2001).
- SMEs lack the human and financial resources and capabilities of large firms (Ettlie, 1983; March, 1981). Lack of financial resources makes it critical for SMEs to pick their strategies carefully (Lynn et al, 1999).

Figure 12.2. Key drivers and barriers for manufacturing sector

Key Drivers for ICT Development in Manufacturing

- To link and integrate with suppliers
- To link and integrate with customers
- To improve internal link and integration with other departments
- To improve efficiency and competitiveness
- To reduce costs
- To streamline production and operation processes
- To enable real time data processing and availability
- To reduce paperwork
- Ability to track changes or progress, e.g. engineering, logistical/distribution route
- Ability to operate on-line and network
- Business Process Reengineering (BPR)
- To enable globalisation

Key Barriers to ICT Development in Manufacturing

- High set-up and running costs, especially for Small and Medium sized Enterprises (SMEs)
- Lack of expertise, skills and knowledge
- Lack of resources
- Lack of technology
- Lack of management support
- Lack of education and training
- Inefficient government support for SMEs

Exhibit 12.1.

Mini case: Manufacturing excellence implementing ICT

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Gripple is a Sheffield based manufacturing company that employs 147 people and has an annual sales turnover of £14.6m. It is recognized as the world's most innovative way of joining, tensioning, terminating and suspending wire and wire rope. Over the years innovation through product development has remained the core of the company's successful operation. Gripple has been granted many awards for their products. They provide a safer, faster and neater solution to their customers and this is why they receive an overwhelming reaction when users first encounter the product. The company invested in the technology right from the beginning. This forward thinking strategy and investment in the appropriate IT infrastructure has opened a wide global market to this company as the main business for Gripple is exporting. Every day their market share increases due to available information and communication systems. Their latest technological investment is in a cutting edge 'Loadhog' (a device for securing boxes to a pallet instead of shrink wrap plastic) with a Global Positioning System (GPS) included - navigation, communication and solar satellite technology - which will enable the company to follow their products around the globe and consequently allow them to act faster if necessary. However, further work needs undertaking before this becomes a reality. Energy cell specification, needed to power this kind of facility, requires significant advances in technology to make this viable. Overall, the only disadvantage for Gripple Ltd is that some of their suppliers, whose owner/managers are lacking the same enthusiasm about an IT investment, are preventing Gripple from full e-business integration (Source Pavic et al, 2004)

Exhibit 12.2.

Mini Case – Innovative approach of utilizing ICT for an information provider

In order to compete with global competitor and higher customer expectation, there is a need for the firm to constantly re-evaluate their business strategies including the organisational structure. The firm is treating the internet site as a partnership between their customers and themselves. As a result, the utilization of ICT has lead to excellent decision-making. Internal and external communications are seen as being very good and speedier than before. In addition, vital work can be transmitted to staff at home because of the availability of Internet to ensure accurate information is conveyed constantly. Because of the new emerging trend of communicating to customer using ICT, the primary mode of communication is to use e-mail. As a result, customer feedback is received instantly and a general reduction in paperwork. Table 12.1 lists the generic key drivers and barriers for developing ICT in a service sector.

Figure 12.3. Key drivers and barriers for Service sectors (adapted from Oldham, 2003)

Key Drivers for ICT Development in Services

- Management-oriented – they provide information which can be used either by the service provider or a customer to control the operation of **complex systems**
- **Sustainable** – create significant environmental and/or social as well as economic benefit
- Interconnected decision making process,
- Improved responsiveness to customer service and internal process,
- **Tracking** – to monitor the position and state of key components of the system
- **Real-time** – much of the data being utilised is immediate in nature
- Streamlined and removed non value added activities;
- Enhanced customer experience and competitiveness.
- Analytic – this control is achieved through identifying patterns and connections within large bodies of data

Key Barriers to ICT Development in Services

- Unclear Return on Investment,
- Lack of commitment
- Require ICT expertise
- Data protection issues – ICT takes away control from the individual
- Culture of company, supplier, customer, competitors, supply chain, demand chain and industry
- Time consuming
- Underestimated amount of change required
- Uncertain responsibilities to users and workforce
- Quick changes and new systems in short period of time
- Costs and benefits are not clear to adopter
- Lack of trust
- Lack of sustainable and continuous effort to maximise benefits from ICT.
- High set-up and running costs

Exhibit 12.3.

Mini Case - A firm specialising in providing ICT services

One of the biggest challenges for this firm is to meet the customer expectations. Because of the firm present in the public domain (Internet), it means that the firm has to ensure all the business processes and the coordination among its customers have to be précised to reduce error and maximize their profitability. As a result, the deployment of ICT has enable the firm to work 'quick and smart' in terms of their decision-making through day to day learning experience. In order to maintain the consistency of ICT deployment within the firm, top management need to ensure that both the customers and employees understand the direction and the company is trying to achieve.

Exhibit 12.4.

Mini Case - A firm supplying a range of insurance services

In order to create competitive advantage to increaser their market share in the industry, this firm has to undertake some re-engineering to take full advantage of their use of ICT. The firm's decision-making process is described as efficient in a competitive sector. Also, there is a realization that this will have a direct bearing on bottom-line profitability. However, it has been noticed that the use of ICT has lead to an increase, rather than decrease, in workload. This is due to the nature of their products that is changing daily and this requires them to provide prospective customers with up to date information. By changing the way of employee using the ICT, there has been a major culture change as everyone can find information and staff, customers and business partners need to receive e-mails at the appropriate time. This has lead to a change in working procedures. Consequently, they have spent a lot of effort ensuring that their supply chain management procedures are effective. E-mails are the major mode of communication to customers in order to build sustainable business relationships.

Exhibit 12.5.

<u>Mini Case - A firm providing a range of business services</u>

Similar to other service industry, this firm has designed on-line forms and installed working practices to ensure their business strategy was up-to-date in parallel with ICT development. This has been a major culture change for this organisation because top management of the firm realise that they have not succeeded in getting it right at the present time. The firm realise that culture change will soon be a necessity whereas at the moment they are in reactive mode and are just adjusting to the changes brought about by ICT. The problem is also obvious during the peak times. The added flexibility in their systems has led to 'problems' are sent to them on-line. There have also been changes in work design which usually entails roles being roughly the same but in different organisational settings. As yet they have not reorganised the structure of the firm. They also view communications as being very good and fast. Another problem face by the firm is the security issues. As a result, they do not share information with any vendor.

Exhibit 12.6.

<u>Mini Case - A firm providing a range of social and sporting services</u>

The introduction of ICT has led this company to readdress its strategy on a day by day basis. Some of the issues face by the company includes the problem of monitoring web pages especially in the evenings and some concern about the change in culture brought about by the ICT. It is viewed as being similar to a shop being open all day. Times, for booking, can be seen by both staff and potential customers. A number of comments suggested that there is a somewhat divisive element to the use of ICT within this firm as it is suggested that young staff are au fait with the technological changes whereas the older staff were quite happy using the previous systems. This has resulted in a number of part-time staff being more proficient in the use of the new systems than employees who have been at the firm for several years.

Learning and Education Sector

Figure 12.4. Key drivers and barriers for ICT development in Learning and Education Sector (adapted from Queensland government, Australia, 2002-2003)

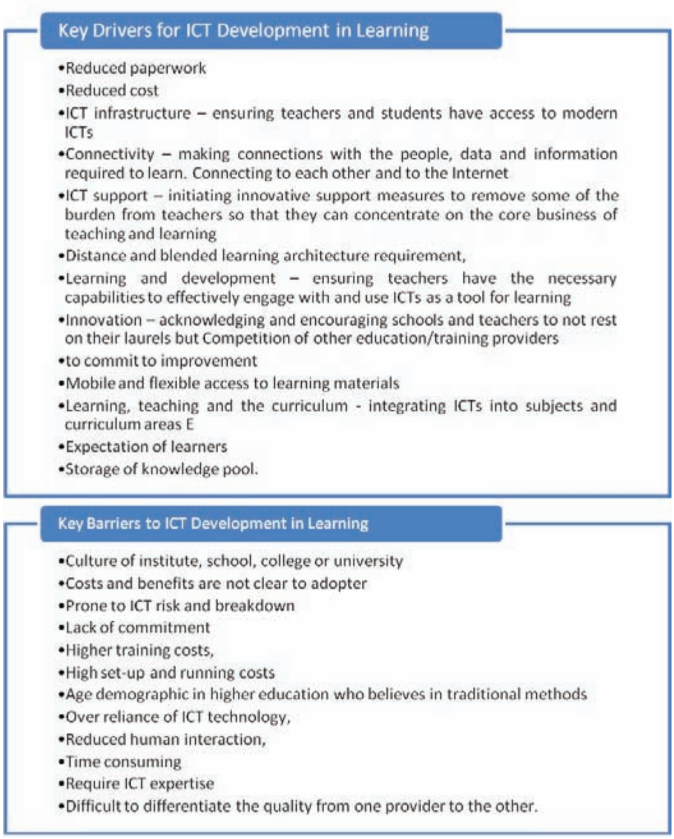

Exhibit 12.7.

Mini Case – A University

A University has just implemented a new on-line learning system three years ago. The process include one-year pilot run was carried out in specific departments in order to test the adaptability and flexibility of the new system to assist and improve teaching delivery and learning experience of students. This pilot run is the most critical in ensuring the success in developing and implementing the new on-line learning system across all departments in the University. However, there are still many resistances from individual department even after the pilot run. This is due to the need to unlearn the old style of teaching delivery and the need to learn the new style. Fortunately, the resistance to change quickly subsided after the full scale implementation. This has been overcome through series of training events within departments.

Agriculture Sector

Figure 12.5. Key drivers and barriers for ICT development in agriculture sector (Adapted from Sartain, 2003)

Key Drivers for ICT Development in Agriculture

- Financial – the ability to manage land more profitably
- Reduction in tractor fuel usage
- Additional benefits generated from data monitoring. For example, if a tractor is idling unnecessarily
- Increased information flow transparency and data accuracy on land registry especially in developing/ merging economies
- Reduction in application of pesticides and fertilisers. For example, one farm has reduced nitrogen input by 34%
- Improved record keeping on resources and materials required, B2B opportunity (e.g. farmer and fertilizer suppliers)
- Information provision and traceability – particularly important in nitrogen vulnerable zones
- B2C opportunity (e.g. farmer and farmer market/consumer).

Key Barriers to ICT Development in Agriculture

- Precision farming is not available to many farmers – it tends to be limited to large scale farms
- Costs – it is perceived to be very expensive. It can cost £4500-£12000 to set-up
- Only 50% of farms have a computer
- Farmers are not keen to pay for training
- Reduced human interaction and this is important in this sector
- Most operating in this sector cannot visualise the benefits from ICT (i.e. cost outweighs benefit)
- Fear of technology
- Geographical location prohibits broadband and other higher tech ICT (i.e. access problem)
- Problems with compatibility of equipment
- IT skills are required to implement the system
- ICT has not been treated as an order winning criteria in this sector.

Exhibit 12.8.

Mini Case: ICT Development in Agricultural sector

The adoption of ICT in agriculture sector is becoming a new trend. This is due to the need to compete in the marketplace whereby retailers are pushing more pressure on farmers to improve performance (vertical competition), and at the same time the horizontal competition (amongst competitors) in the industry. There are vast amount of knowledge accumulated in this sector, which has been kept in silo for years. This has prevented any knowledge sharing and reduced the possibility of rapid innovation in this sector.

An e-agriculture platform has been launched in September 2007 (www.e-agriculture.org). The e-agriculture platform is a global initiative to enhance sustainable agricultural development and food security by improving the use of information, communication, and associated technologies in the sector. The overall aim is to enable members to exchange opinions, experiences, good practices and resources related to e-agriculture, and to ensure that the knowledge created is effectively shared and used.

prove efficiency. As a result, the old dot.com 'get-rich-quick' mentality has been abandoned and the attention is now focus on utilizing the practicalities of ICT for long term development and sustainability within an organization.

It is imperative to address the key barriers drivers in order to promote the development of ICT within an organization. Some of the significant **barriers.to.ICT. development** include set-up and running costs, lack of time/resources and lack of knowledge. Unfortunately factors such as time, money and knowledge triangle creates a self-perpetuating problem unless it is deemed important enough to break. The generic driver and barriers for ICT development are summarised in Figure 12.1 (Pavic et al. 2006).

The key **drivers.for.**and barriers to **ICT.development** can be summarised to a specific sector (manufacturing) is shown in Figure 12.2.

FUTURE TRENDS AND CONCLUSION

In the future, ICT development will span across diverse sectors, as opposed to within the traditional manufacturing and services sectors. The level of its development will call for a "**plug-and-play"** approach, leading to the use of **modular.system**.

This cross platform flexibility will enhance competitiveness in the ICT development provision business, where enterprises will have a greater choice in selecting the best of breed modules for specific objectives. **Open.source** software and outsourcing IT provision services will also add to the pressure of the service providers.

Overall, it is clear that the benefits will be greater for the users, but competitiveness will be greater for the providers. Hence, it is essential that a better understanding of the drivers for and barriers to ICT development must be made in order to reach a strategic decision on ICT development internally or externally.

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Chapter XIII
Current Developments and Diffusions in ICT: ERP, SCM, CRM

Although Boeing and Rolls-Royce are operating in the same aerospace industry sector and use ERP, but the ways that they implemented their systems are completely different. Boeing uses big bang and treats ERP as a system implementation, whilst Rolls-Royce uses phased implementation and treats ERP as a philosophy. Both companies experience different outcome as a result of their approaches. (Koh, 2006)

Dell has a "build-to-order" business model that clearly integrates both supply and demand chains. That model has worked astonishingly well for Dell, its customers and its key suppliers. In fact, Dell could not do what it does if it designed and managed its supply chains and Customer Relationship Management (CRM) as separate technical entities. The "build-to-order" business value proposition demands an architecture that inherently integrates customers and suppliers. Yes, Dell has a "supply chain," but it coevolves in the context of explicit customer demand. (Gunasekaran and Ngai, 2005)

ICT Developments and Diffusions Defined

ICT development can be defined as using combination of hardware, software, and network, the Internet and new concepts, to develop an information and communication system for information storing, retrieval, processing and sharing.

ICT diffusions can be defined as the uptake and wide spread of using ICT in certain context, e.g. in businesses.

These include the adoption of Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationships Management (CRM) systems in businesses.

ENTERPRISE RESOURCE PLANNING (ERP)

In the 90s, ERP emerged as the most implemented, and sold as an enterprise solution to many enterprises across industry sectors around the world. Table 13.1 shows the applications of ERP around the world, as compared to SCM and CRM.

Large-scale enterprises were originally being targeted, but today's SME are in the league table, head-to-head with their counterparts (B2B) and shoulder-to-shoulder with their customers (B2C), to enhance their competitive advantage through ERP implementation. The large-scale enterprises are moving towards global integration and implementation through networking the entire business processes. Examples of these enterprises are Nestle Corporation and Rolls-Royce Plc. Figure 13.1 shows the modules in an ERP system (adapted from SAP R/3).

Modules in an ERP System

Boston-based Advanced Manufacturing Research (AMR) predicts the ERP market will reach USD69 billion by 2003 at an estimated compound annual growth rate of 32% (Angerosa, 1999). Table 13.2 shows the ERP market opportunity.

One of the main drivers of the emerging trend of SMEs implementing ERP systems is the pressure from the big player (their business customer). ERP systems enable orders to be made with a click away and performance to be monitored real-time. Many SMEs need to be equipped with this type of technology to provide a

Table 13.1. ERP, SCM and CRM applications

The global distribution of enterprise applications				
	ERP	**SCM**	**CRM**	**Total**
Latin America	5%	2%	1%	4%
Asia/Pacific Rim	10%	8%	6%	10%
Europe	**31%**	**16%**	**17%**	**30%**
North America	**54%**	**74%**	**76%**	**56%**
Source: adapted from AMR research, 1999				

Figure 13.1. ERP modules

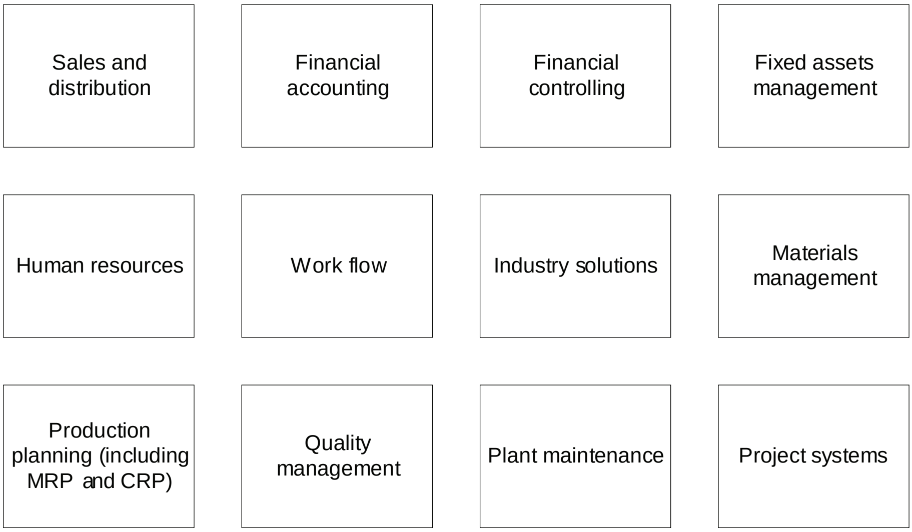


Table 13.2. ERP market opportunity

ERP market opportunity					
Total.ERP.revenues,.1997-2002.forecast					
1997	1998	1999	2000	2001	2002
USD10.9 billion	USD14.4 billion	USD20.3 billion	USD27.8 billion	USD38.1 billion	USD52.2 billion
• License revenue will exceed USD20 billion by 2002 (overall market USD52 billion)					
• Non-manufacturing verticals will generate a growing percentage of revenues					
• Geographic expansion remains a big growth opportunity					
• ERP vendors will continue to expand their application scope					
• The percentage of users that touch an ERP system will continue to grow					
• Multi-vendor opportunity remains					
Source: AMR research, 1996					

better and competitive service to their customers. This technology becomes easily assessable due to the advent of the Internet. This further leads to the total e-business solutions for the entire network. Some of the leading midrange ERP systems: Alliance Manufacturing (part of Kewill), MFG/PRO (QAD) and WinMan (TTW); and the big five ERP vendors: SAP, Oracle, JDEdwards, PeopleSoft and Baan; have started to move towards the e-business suite approach.

Concept of ERP

Enterprise Resource Planning (ERP) can be defined as an accounting-oriented information system for identifying and planning the enterprise wide resources needed to take, make, ship and account for customer orders. An ERP system differs from the typical MRPII system in technical requirements such as graphical user interface, relational database, use of fourth-generation language and computer-aided software engineering tools in development, client/server architecture and open-system portability.

Ross Altman, an ERP analyst (GartnerGroup) defined **ERP** as a software that addresses what are essentially back office tasks, such as human resource and finance as well as manufacturing to front office coverage such as sales force automation and supply chain management functionality, but their core competency is still the back office and that is their primary focus for both marketing and investment.

At the strategic level, **Enterprise.Resource.Planning.(ERP)** system is defined as an integrated application program for enterprise business organisation, management and supervision (Davenport, 1998). ERP collects all the functionalities of stand-alone applications, and gathers inside standard software, making it compatible with different business processes.

At the operational level, ERP is a game plan for planning and monitoring the resources of a manufacturing enterprise, including the functions of manufacturing, marketing, finance, and engineering (Wight, 1993).

Functions of ERP

ERP represents the application of the latest IT to Manufacturing Resource Planning (MRPII) systems and it is related to the fundamental techniques of Material Requirements Planning (MRP) in that if they are used as a production planning and control tool, they follow the same MRP release logic (Enns, 2001; Miltenburg, 2001). Hence, the outputs (i.e. **Planned.Order.Release.(POR).schedules**) generated from such tool are identical (Koh and Saad, 2002). Within an ERP system, this will be generated from the production planning module.

Their planning capability could offer substantial gains in productivity, dramatic increases in customer service, much higher inventory turns, and a greater reduction in material costs, if they are used efficiently and facilitated by necessary support.

Within an enterprise, each individual department typically has its own computer system optimised for the particular ways that the department does its work. Nevertheless, ERP gathers them all together into single, integrated software program that runs off a single database so that a number of departments can easily share information and communicate with each other.

Figure 13.2 and 13.3 underline the logical differences between a stand-alone and an integrated architecture for enterprise business management.

This integrated approach can have a remarkable payback if enterprises implement the software correctly, because these features bring about a general reduction of error occurrence due for instance, to non up to date data or manual data transfer

Figure 13.2..Stand-alone applications architecture (Source: Loh & Koh, 2004)

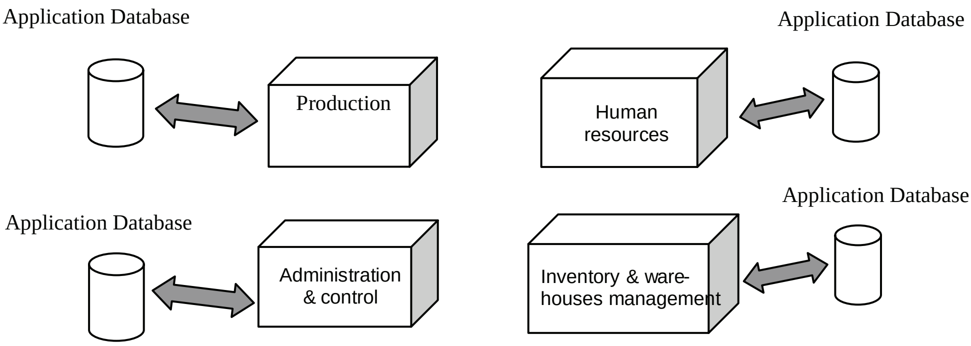
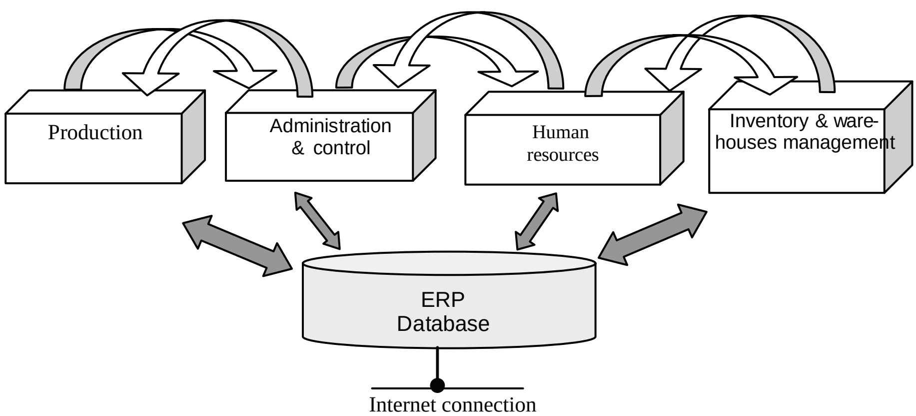


Figure 13.3. ERP integrated architecture (Source: Loh & Koh, 2004)



operations between applications. The effect of such integrated approach would mean that higher levels of processes efficiency could be achieved, as the system provides better information that enables better decisions making.

Such an integrated approach is supported by some technological innovations, which include **Relational.Database.Management.Systems.(RDBMS)**, **Graphical. User. Interface. (GUI)**, open systems and client/server architecture. Today, web-enabled ERP systems which are facilitated by **Online.Analytical.Processing. (OLAP)** capability (Chen *et al*, 2003) and a total e-business solution approach (also known as extended enterprise or ERPII) via integration with Supply Chain Management (SCM) software and Customer Relationship Management (CRM) software (Tarn & Razi, 2002) are the key technological development by many ERP vendors (http://www.fs.com and http://www.sap.com).

Value-Added from ERP

ERP manages the order fulfilment process of a business. ERP is often referred to as back-office software and it does not handle the up-front selling process. ERP takes a customer order and provides a software road map for automating the different steps along the path to fulfilling it. When a customer service representative enters a customer order into an ERP system, he/she has all the information necessary to complete the order, e.g. the customer's credit rating and order history from the finance module, the company's inventory levels from the warehouse module and the shipping dock's trucking schedule from the logistics module.

There is a total transparency of information across different departments to ensure data integrity and information is updated without conflicting or duplication of data. As soon as one department completed the order it is automatically routed via the ERP system to the next department. In order to locate the order at any point, the user only need to log in to the ERP system and track it down.

ERP can be applied to generic business processes such as employee benefits or financial reporting. However, research shows that the ERP implementation is not always that smooth and reality is much harsher. Figure below provide a scenario where ERP is not always a smooth process.

There are also some emerging issues that were never encounter before such as "will the customer pay on time?", "will we be able to ship the order on time?" and the answers will affect the customer and every other department in the company. To ensure that ERP is successfully implemented, employees, customer and business stakeholders need to be aware of the implementation and to provide education and training if necessary. For example, employee in the warehouse who used to keep inventory in their heads or on scraps of paper now need to put that information online. Otherwise, customer service representative will assume the low inventory levels on their screens and tell customers that their requested item is not in stock. Everyone involved need to be ensured that the accountability, responsibility and communication are in order because these have never been tested before.

Duration of an ERP Project

Correctly implementing ERP is essential for businesses in order to change the ways they performed their jobs and the business process (Loh & Koh, 2004; Yahaya et al, 2004). The important lesson is not to focus on how long it will take because real transformational ERP efforts usually run between one and three years, on average —but rather to understand why the organization need it and how the use of ERP will improve the organization business. Due to various rapid implementation blueprints, it is increasingly possible that organizations could implement ERP in six months.

Rationale for the Need of an eRp in an Organization

There are five major reasons why companies undertake ERP as illustrate in Figure 13.4.

Business Facilitation from ERP

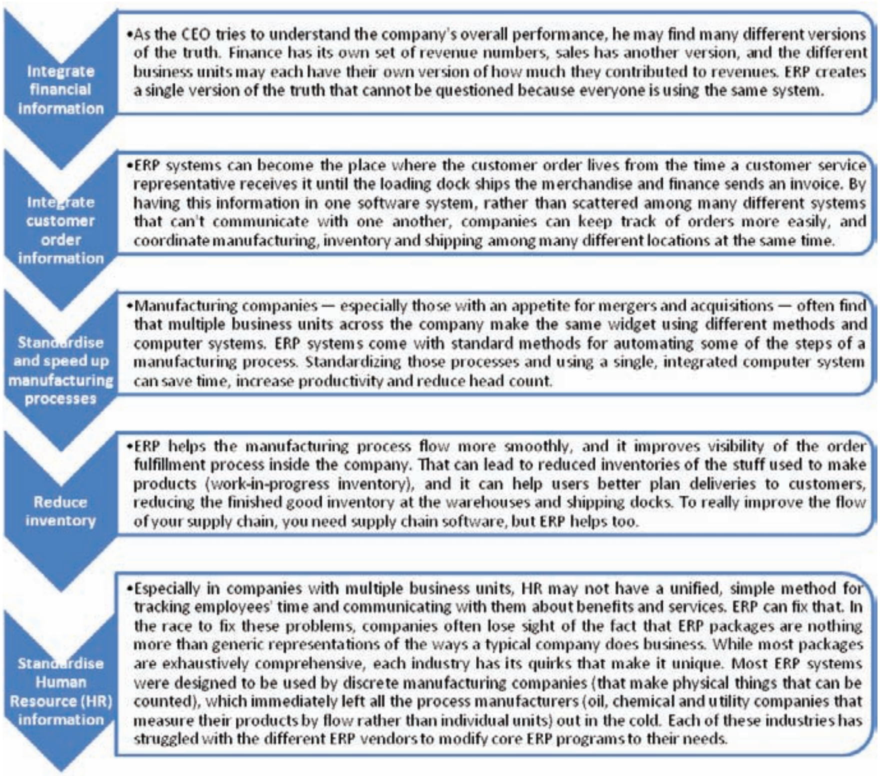
It is critical for companies to understand if their ways of doing business will fit within a standard ERP package the implementation begins. The most common reason that companies walk away from ERP projects is that they discover the software does not support one of their important business processes (Yahaya et al, 2004).

There are two ways to proceed with fitting ERP in a business: namely (1) Business Process Reengineering (BPR), or (2) System customisation. In BPR, organisations can change the business process to accommodate the software, which will mean major changes in long-established ways of doing business and subsequently affecting roles and responsibilities. In systems customisation, organisations can modify the software to fit the business process, which will slow down the project, introduce dangerous bugs into the system and make upgrading the software to the ERP vendor's next release difficult because the customizations will need to be rewritten to fit with the new version.

These are major decisions because both have major financial implications to the organisations.

In addition to budgeting for software costs, the financial plan should cover consulting, process rework, integration testing and training before the benefits of ERP start to manifest themselves.

Figure 13.4. Reasons for ERP



Cost of ERP

Meta Group recently did a study looking at the Total Cost of Ownership (TCO) of ERP, including hardware, software, professional services and internal staff costs. This includes getting the software installed and the first two years after implementation. Among the 63 companies surveyed—including small, medium and large companies in a range of industries—the average TCO was $15 million (the highest was $300 million and lowest was $400,000). While it's hard to draw a solid number from that kind of range of companies and ERP efforts, Meta came up with one statistic that proves that ERP is expensive no matter what kind of company is using it.

In general, a mid-range ERP costs about £25k, and a large scale ERP costs about £4 million. These are software cost, and exclude training, customisation and so on.

Return on Investment (ROI) from ERP

To measure Return on Investment (ROI) for ERP implementation is not a straight forward task. This is due to other indirect cost and indirect benefits associated to ERP implementation. Some organisations do not measure success of ERP implementation using ROI, rather they use “business benefits”. This captures the intangible benefits. In general, 3-5 years are typical expectation in realising the benefits.

Hidden Costs of ERP

- **Training:** This depends on the types of training undertaken, i.e. behavioural or transactional. Behavioural training is very important in order to get employees buy in and change the culture within the organisation on the perception of ERP use. Transactional training is about “which button to press”. The training cost is proportional to the number of parts, number of data, number of users, and so on. It is necessary for the organisation to understand training is not a one-off expense within ERP implementation, but a continuous activity aiming to ensure latest release and features within the systems can be exploited.
- **Integration.and.testing:.** Many organisations may have a legacy system or a separate system in use, whilst implementing ERP. The integration of the new system with existing system (not to replicate the functions) is very important in order to ensure data compatibility and report generation efficiency. The

Exhibit 13.1.

Mini Case - Training

Texas-based pharmaceutical distributor - FoxMeyer Drug, actually collapsed following a SAP R/3 implementation. Its bankruptcy trustees filled a USD500 million lawsuit in 1998 against the German ERP giant, and another USD500 million suit against co-implementer - Andersen Consulting.

Lessons: -

1. *Training should be separated into education (why, who and where issues) and training (how issue).*
2. *Jim Shepherd, senior vice president of research, AMR Research states that “Senior managers often don’t want to be told that there’s a high level of risk and that there’s a great deal of expenditure involved in minimising*

testing of the integratedness of modules and systems is time consuming, hence the cost associated to this is often very difficult to estimate and hence get out of control easily (Yahaya et al, 2004; Koh et al, 2006).

- **Customisation:** Add-ons are only the beginning of the integration costs of ERP (Koh et al, 2006a). Much more costly, and something to be avoided if at all possible, is actual customization of the core ERP software itself. This happens when the ERP software can't handle one of your business processes and you decide to mess with the software to make it do what you want. The customisations can affect every module of the ERP system because they are all so tightly linked together. It is uncertain whether the customisation will work. With customisation, the vendor will not be there to support you. You will have to hire extra staffs to do the customisation work or outsource the work.
- **Data. conversion:** It costs money to move corporate information, such as customer and supplier records, product design data and the like, from old systems to new ERP homes. Not all data are kept in the same format and structure. This will create compatibility problems with new systems, which necessitates data to be converted. Companies often deny their data needs to be purged until they actually have to move it to the new client/server setups that popular ERP packages require. Consequently, those companies are more likely to underestimate the cost of the move to the new system.
- **Data.analysis:.**Often, the data from the ERP system must be combined with data from external systems for analysis purposes. Users with heavy analysis needs should include the cost of a data warehouse in the ERP budget—and they should expect to do quite a bit of work to make it run smoothly. Users are in a pickle here: Refreshing all the ERP data every day in a big corporate data warehouse is difficult, and ERP systems do a poor job of indicating which information has changed from day to day, making selective warehouse updates tough. One expensive solution is custom programming. The upshot is that the wise will check all their data analysis needs before signing off on the budget (Yahaya et al, 2004).
- **Consultants:** Consultancy fees will increase significantly if post-implementation is not handled appropriately. Organisations should identify objectives for which its consulting partners must aim when training internal staff. Include metrics in the consultants' contract; for example, a specific number of the user company's staff should be able to pass a project-management leadership test—similar to what Big Five consultants have to pass to lead an ERP engagement. Sustainable and continuation internally of ERP operation in the organisations are paramount in order to reap the benefits from this system.

- **Staffing:** ERP success depends on staffing the project with the best and brightest from the business and IS divisions. The software is too complex and the business changes too dramatic to trust the project to anyone. Both internal and external (e.g. consultants, vendors) staffing are key in ensuring a successful ERP implementation.
- **Implementation teams:** ERP implementation does not stop when the software is implemented. The implementation team will continue with further post-implementation activities, for example, generating reports format and so on. Because they have worked intimately with ERP, they know more about the sales process than the salespeople and more about the manufacturing process than the manufacturing people. Companies cannot afford to send their project people back into the business because there is so much to do after the ERP software is installed (Yahaya et al, 2004). Unfortunately, few IS departments plan for the post-ERP installation activity, and fewer build it into their budgets when they start their ERP projects. As a result, many are forced to request for more money and staff immediately after the go-live date, long before the ERP project has demonstrated any benefit.
- **Waiting for Return On Investment (ROI):** One of the most misleading legacies of traditional software project management is that the company expects to gain value from the application as soon as it is installed, while the project team expects a break and maybe a pat on the back. Neither expectation applies to ERP. Most of the systems don't reveal their value until after companies have had them running for some time and can concentrate on making improvements in the business processes that are affected by the system. And the project team is not going to be rewarded until their efforts pay off.
- **Post-ERP depression:** Post ERP depression may occur within an organisation after a long and involved ERP implementation and change project. The most common reason for the performance problems is that everything looks and works differently from the way it did before. When people can't do their jobs in the familiar way and haven't yet mastered the new way, they panic, and the business goes into pear shape. The post ERP depression needs to be managed accordingly, for example, with the help of appropriate training and education.

The Causes of ERP Failures

At its simplest level, ERP is a set of best practices for performing different duties in your company, including finance, manufacturing and the warehouse. To get the most from the software, you have to get people inside your company to adopt the work methods outlined in the software (Al-Mashari et al, 2002). If the people in the different departments that will use ERP don't agree that the work methods embedded in the software are better than the ones they currently use, they will resist using the software or will want IT to change the software to match the ways they currently do things. This is where ERP projects break down.

People don't like to change, and ERP asks them to change how they do their jobs. That is why the value of ERP is so hard to pin down. The software is less important than the changes companies make in the ways they do business. If you use ERP to improve the ways your people take orders, manufacture goods, ship them and bill for them, you will see value from the software. If you simply install the software without changing the ways people do their jobs, you may not see any value at all—indeed, the new software could slow you down by simply replacing the old software that everyone knew with new software that no one does.

A long and expensive customisation effort to modify the ERP software to fit with powerful business organizational need is one of the major causes of ERP failures. Customisations make the software more unstable and harder to maintain when it finally does come to life. The horror stories you hear in the press about ERP can usually be traced to the changes the company made in the core ERP software to fit its own work methods. Because ERP covers so much of what a business does, a failure in the software can bring a company to a halt, literally.

Misunderstanding of the main purpose of ERP in an organization has been a major cause of ERP failure. Using ERP to automate an existing business process is a very expensive way of continuing the inefficient process, prohibiting improvement to be made in the organization which could be leveraged through ERP. ERP should be adopted as a way to improve business process hence brining greater integration and efficiency within an organization.

But IT can fix the bugs pretty quickly in most cases, and besides, few big companies can avoid customising ERP in some extent. Every business is different and is bound to have unique processes that a vendor cannot account for when developing its software. The mistake many companies make is assuming that changing people's habits will be easier than customising the software. This is not true and in fact getting people internal in the company to use the software is by far the hardest hurdle. If your company is resistant to change, then your ERP project is more likely to fail.

Despite the extensive research and development on improving the success rate of ERP implementation, Markus et al (2000) found that most of ERP implementation projects fail to achieve their corporate goals. Most past development was conducted in the context of larger enterprises, but Koh et al (2006b) found that enterprises of different sizes approach ERP implementation differently across a range of issues. There are common and unique critical elements for a successful ERP implementation, implying one size does not fit all.

The development relating to the implementation of ERP systems in SMEs has been increasing rapidly over the last few years (Loh & Koh, 2004). Therefore, it is important, particularly for SMEs, to recognise the elements for a successful ERP implementation in their environments, which are usually restricted by knowledge and resources constraints.

The Potential Solutions to ERP Failures

The high failure rate of ERP calls for a better understanding of its Critical Elements (CEs) that constitute a successful ERP implementation. Figure 13.5 shows a reference framework for a successful ERP implementation (Loh & Koh, 2004). It must be noted that these CEs and their constituents could also be adapted for SMEs and larger enterprises.

The framework shows the three main CEs that consisted of ten **Critical.Success. Factors.(CSFs)**, nine **Critical.People.(CP)** and twenty-one **Critical.Uncertainties. (CUs)** identified to be significant on the success of an ERP implementation, which were linked to particular phases of ERP implementation. This framework collated such knowledge to provide managers, vendors and implementers with indicators and guidance on their ERP implementation project especially for those who are planning to implement such system. It shows the elements they need to be aware of and also the constituents at each phase of ERP implementation. This useful indication was expected to enable enterprises to look out for the critical issues before and during implementation. Such framework will also be useful for researchers in this field in order to focus on the study of the CEs and particular constituents that affects ERP implementation.

The results showed that most of the CSFs were found to be significant at the chartering phase, and majority of the CUs occur at the chartering phase and project phase. Therefore, it was clear that meeting and managing the CSFs, CP and CUs at the chartering phase is the key start-up stage towards a successful ERP implementation. The particular linkage of the CSFs, CP and the CUs in the framework represented the first effort or momentum required at that specific phase on that particular factors in order to ensure a successful ERP implementation.

The involvement of ERP vendors, consultants, company executives and IT specialists were found to be apparent at chartering phase, project phase and shakedown phase. This finding showed that these CP appeared to be the initiators and decision makers for an ERP implementation in an enterprise. However, the results also indicated that operations manager, end users and IT support personnel within the enterprise do contribute to these phases in ensuring a successful ERP implementation. However, their main roles were found to be more critical at onward and upward phase. Project manages and project team members were found to be the CP at project phase and shakedown phase, and this finding was expected.

Figure 13.5. A reference framework for a successful ERP implementation (Source: Loh and Koh, 2004)

ERP implementation phases	Chartering Phase	Project Phase	Shakedown Phase	Onward & upward Phase
Critical Success Factors (CSFs) of ERP implementation	* Project champion * Project management * Business plan and vision * Top management support * Effective communication * ERP teamwork and composition	* BPR and minimum customisation	* Change management program and culture * Software development, testing and troubleshooting	* Monitoring and evaluation of performance
Critical People (CP) in ERP implementation	* Vendors * Consultants * Company executives * IT specialists * Operations Manager * End users (representatives) * IT support personnel	* Vendors * Consultants * IT specialists * Project manager * Project team members (mainly from business units and funtional areas) * Operations Manager * End users (representatives) * IT support personnel	* Vendors * Consultants * Company executives * IT specialists * Project manager * Project team members (mainly from business units and funtional areas) * Operations Manager * End users (representatives) * IT support personnel	* Vendors * Consultants * Operations Manager * End users (representatives) * IT support personnel
Critical Uncertainties (CUs) in ERP implementation	* Insecure funding / unrealistic budget * Inappropriate software selection and evaluation * Inexperienced project leaders * Non-committed project partners * Poor project planning * Ineffective communication * Poor team work * Unclear role and responsibility (vendor and internal staff)	* False software configuration and system integration * Communication breakdown * Conflict between business objectives and ERP system objectives * Labour shortage * Unskilled personnel * Poor data collection	* Employees' resistance to change from traditional process to ERP process culture * Difficulty in defining the business aspect within the SME that needs to be changed (with respect to software customisation)	* Problems in authorising access to the relevent data in the ERP system * Unclear system maintenance discipline * Unclear procedure to operate and fully utilise the ERP system * Outdated data

Table 13.3. Tips for enterprises before ERP systems implementation

Tips.for.enterprises.before.ERP.systems.implementation	
1	Research a suitable standard package for your enterprise or your industry sector
2	Customise the standard package after it is proven to be stable
3	Involve everyone in the implementation project (change management programme)
4	Tie the vendor to some kind of performance contract
5	Check out any glowing reports of customer satisfaction mentioned by the vendor
6	If you have £40k to spend for programmer, buy two for £20k each because nobody's worth £40k
7	Use the parallel stage implementation approach
8	Purge your BOM, inventory records, capacity planning and Item Master
9	Communicate with sales to align ATP with demand (improve responsiveness of MPS)
10	Be open-minded, accept change and best practices to enhance business competitiveness through IT

ERP Software Configuration

The packages are built from database tables, and they have to match the business processes. Each table has a decision point that leads the software down one decision path or another. This suggests that ERP structure is very rigid and not flexible. Identifying exactly how to set all the points in the tables requires an in depth understanding of the existing processes used to operate the business. As the table settings are decided, these business processes are reengineered the ERP way.

Most ERP providers offer standard vanilla ERP systems to the organizations. However, most businesses will have some unique way of handling their process and hence necessitating ERP software configuration to meet the needs of the organizations. It is important to bear in mind that excessive configuration to an off the shelf ERP software may lead to a more expensive system as compared to developing a totally tailored ERP system. Care must be taken in order to evaluate the business and financial cases for ERP configuration. This should be done right at the beginning of ERP systems selection, and not during ERP implementation. The latter will be too late!

ERP Implementation Approaches

There are four commonly used approaches of implementing ERP.

- **The.Big.Bang:** The big bang approach is the most ambitious and difficult approach to ERP implementation. In this, companies cast off all their legacy systems at once and install a single ERP system across the entire company. Though this method dominated early ERP implementations, todays few companies favour this approach because it calls for the entire company to mobilize and change at once. This in turn is a high risk approach. Most of the ERP implementation horror stories from the late '90s warn us about companies that used this strategy. Getting everyone to cooperate and accept a new software system at the same time is a tremendous effort, largely because the new system will not have any advocates. No one within the company has any experience using it, so no one is sure whether it will work. Also, ERP inevitably involves compromises. Many departments have computer systems that have been honed to match the ways they work. In most cases, ERP offers neither the range of functionality nor the comfort of familiarity that a custom legacy system can offer. In many cases, the speed of the new system may suffer because it is serving the entire company rather than a single department. ERP implementation requires a direct mandate from the CEO.

- **Franchising strategy:** This approach suits large or diverse companies that do not share many common processes across business units. Independent ERP systems are installed in each unit, while linking common processes, such as financial bookkeeping, across the enterprise. This has emerged as the most common way of implementing ERP. In most cases, the business units each have their own "instances" of ERP—that is, a separate system and database. The systems link together only to share the information necessary for the corporation to get a performance big picture across all the business units (business unit revenues, for example), or for processes that don't vary much from business unit to business unit (perhaps HR benefits). Usually, these implementations begin with a demonstration or pilot installation in a particularly open-minded and patient business unit where the core business of the corporation will not be disrupted if something goes wrong. Once the project team gets the system up and running and works out all the bugs, the team begins selling other units on ERP, using the first implementation as a kind of in-house customer reference. This approach is less risky, but may increase the duration of an ERP implementation project with potential efforts duplication.
- **Parallel approach or phased implementation:** This is the most risk-adverse approach, where the old (if any) system is run in parallel (as a shadow system) with the new system. If the new system cannot cope with the information and demand, the old approach will act as a stand-by or back-up. This allows stage introduction to the new system and enables coordinated switch over. The parallel approach is robust for any sizes of enterprise. It is important to note that successful adoption of the parallel or phased implementation approach requires 'dress rehearsals', a successful approach practised by Rolls Royce

in their ERP implementation project. Although this is the most risk-adverse approach in terms of implementing the new ERP system, it posses the risk of managing two sets of databases, two sets of processes, and so on which inevitably will increase the risk of errors and mistakes.

- **Slam.dunk:** ERP dictates the process design in this method, where the focus is on just a few key processes, such as those contained in an ERP system's financial module. The slam dunk approach is generally for smaller companies expecting to grow into ERP. The aim is to get ERP up and running quickly and to remove the reengineering in favour of the ERP system's vanilla processes. Few companies that have approached ERP this way can claim much payback from the new system. Most use it as an infrastructure to support more diligent installation efforts down the road. Yet many discover that a slammed-in ERP system is little better than a legacy system because it doesn't force employees to change any of their old habits. In fact, doing the hard work of process re-engineering after the system is in can be more challenging than if there had been no system at all because at that point few people in the company will have felt much benefit. This approach appears to be a feasible and cost effective short term solution, it does not, in the long term, yield significant benefits and improvement to the organization.

Exhibit 13.2.

Mini Case – ERP Systems Rapid Implementation

In 2005, a medium sized electrical manufacturing company in Taiwan was under a lot of pressure from customers to set up a system that could respond to current information need. Their customers are larger sized company, who would prefer to share demand/forecast and inventory information with the case company. With such pressure, the case company started to research a suitable system that could comply with this expectation. They have searched various ERP systems and have eventually decided to choose SAP based on the reason that SAP would provide a special contract deal for the case company. Through a rapid implementation (6 months), SAP was implemented in the case company. This is a record implementation speed in itself. When asked about the critical success factors, the most important factors are "doing all the homework well in advance" – implying the case company has purged all data required in SAP, formatted the information to SAP's format, educating and preparing employees in the case company, educating and training management in the case company. Once the system was implemented, training was then carried out to key employees. The key lesson is ensuring all stakeholders and users are made aware of this change and are part of the process of change at the early stage.

Leading ERP Vendors

SAP is still the largest ERP vendors, globally. This is followed by Oracle, which is now actively acquiring PeopleSoft, the third largest ERP vendor. JD Edwards is a part of PeopleSoft since 2003. In general, the big ERP system vendors are SAP, BaaN, ORACLE and PeopleSoft and the overall market for ERP was predicted to reach USD66.6 billion by 2003 (AMR Research, 1999). To cater for the needs of SMEs, many midrange and less complex ERP systems have been developed, (e.g. Alliance Manufacturing (Exact Software), MFG/PRO (QAD), WinMan (TTW) and Fourth Shift (Fourth Shift)). Table 13.4 shows a list of leading ERP vendors.

Table 13.4. Leading ERP vendors

SAP	www.sap.com
Oracle	www.oracle.com
PeopleSoft	www.peoplesoft.com
123mrp.net	www.rent-it-system.com
invensys	www.invensys.com
ABB Automation	www.abb.com/automation
i2	www.i2.com
SSA Global Technologies	www.ssagt.com
Intentia International	www.intentia.com
Epicor	www.epicor.com
Lawson Software	www.lawson.com
QAD	www.qad.com
IFS	www.ifsab.com
Mapics	www.mapics.com
Mincom	www.mincom.com
American Software	www.amsoftware.com
Great Plains	www.greatplains.com
Ross Systems	www.rossinc.com
SCT	www.sctcorp.com
Cincom	www.cincom.com
Computer Associates	www.interbiz.cai.com
GEAC	www.geac.com
Sage	www.sage.com
Navison	www.navision.com/us/

continued on following page

Table 13.4. continued

Scala	www.scala-na.com
Deltek	www.deltek.com
Fourshift	www.fs.com
Lilly Software	www.lillysoftware.com
Flexi Int'l	www.flexi.com
Glovia International	www.glovia.com
AremisSoft Corp.	www.aremissoft.com
Syspro Group	www.sysprousa.com
ProfitKey International	www.profitkey.com
Solomon Software	www.solomon.com
Macola	www.macola.com
Made2Manage	www.made2manage.com
Visibility	www.visibility.com
PowerCerv	www.powercerv.com
Clarus Corp	www.claruscorp.com
Friedman Corp	www.friedmancorp.com
ROI Systems	www.roisysinc.com
Ramco	www.ramco.com
Intuitive Manufacturing	www.mrp9000.com
Ceecom, Inc.	www.ceecom.com
Technology Group International	www.techgroupintl.com

ERPII

To enable integration and linkage with external suppliers and customers, today, a new concept called ERPII, which represents an extended version of ERP, has emerged (Weston 2003). ERPII supports the concept of an extended enterprise through:

- The integration with suppliers to develop a 21st-century supplier network via linking the ERP system with selected vendors to enable improved supply chain management (SCM); and
- The integration with customers to develop a 21st-century customer network via linking the ERP system with customers to enable improved customer relationship management (CRM).

Any enterprises that have already implemented and used ERP and that are aiming to stimulate stronger SCM and CRM would be the ideal potential beneficiaries of this concept of becoming an extended enterprise via upgrading their ERP system into an ERPII system.

ERPII fully utilizes real-time information flow, also known as information integration. Bowersox et al (2002) highlighted that the information integration makes customer demands, inventory, and production visible throughout the supply chain, which creates a basis for collaborative planning and forecasting. Such information integration aims to reduce uncertainty faced by supply chain members, reduce inventory buffers by postponing costly value-added operations, and may provide better customer service with more flexible response to customer demand. This allows supply chain partners to attain significant productivity gains. The fruits of information integration such as reduced cycle time from order to delivery, increased visibility of transactions, better tracing and tracking, reduced transaction costs, and enhanced customer service offer greater competitive advantages for all participants in the supply chain (Christopher, 1998).

Loh et al. (2006) suggested that many enterprises are willing to embark on ERPII system and the main rationales/benefits as been shown in Figure 13.6:

ERP evolved into a much practiced but loosely named iteration called extended ERP. Extended ERP reflected the fact that many non-manufacturing industries turned to ERP systems for 'backbone' financial transaction processing capabilities (GRG, 2000). The next iteration was called the enterprise application suite (EAS). As enterprises looked to applications that would provide supply chain management (SCM), customer relationship management (CRM) and e-business functionality to enable them to jump ahead of their competitions, ERP vendors responded by pursuing the vision of the enterprise application suite, either through partnerships, acquisitions or native product developments. Figure 13.7 displays this evolution graphically.

There are a number of issues that implementers might face before, during and after **ERP.II.**adoption. As no significant research or detailed publications are available, virtually all (regulated) research in the ERP II arena will contribute to a fresh body of knowledge, albeit the direction initial and subsequent research should take is open for deliberation (Loh et al, 2006). A simple way to go about this is to first list the possible issues that might emanate in the process of adoption, and then to solve the necessary operational constructs needed to mitigate these issues. Care should be taken that these are not carried out in isolation and studies draw from other findings to build a 'common' body of knowledge.

Koh et al (2007b) structured their study in a similar vein. It first 'constructs' a list of issues – *the perceived benefits of, and impediments to, ERP II adoption* and then seeks to mitigate one of the required operational concern that of *formalising*

Figure 13.6. Benefits of ERPII

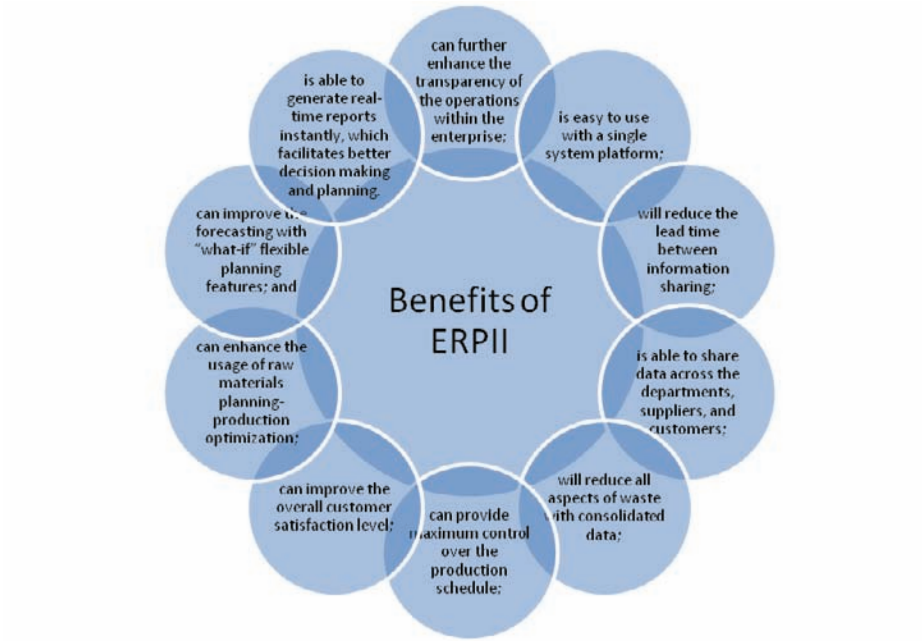
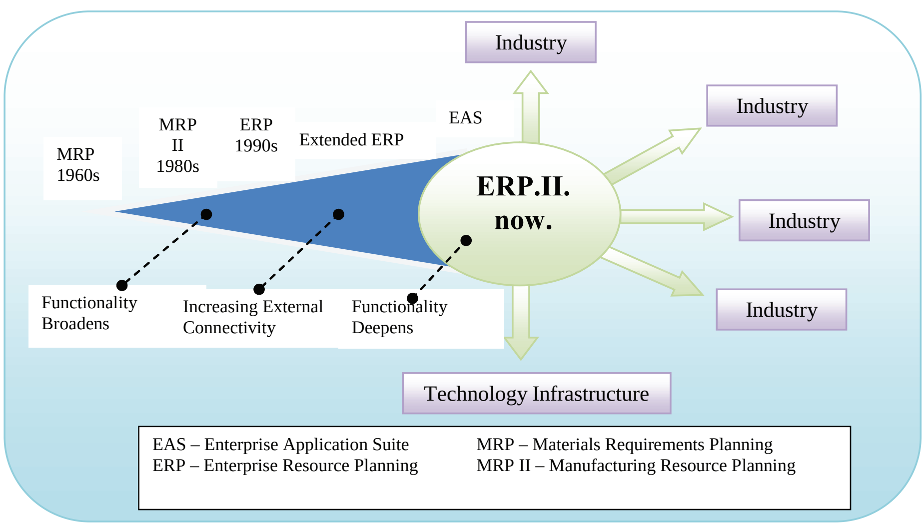


Figure 13.7. The evolution of enterprise systems (Adapted from Gartner Research Group, 2000)



structure types required for inter-firm collaboration (IFC) *(collaboration is necessitated by, and is vital for ERP II).*

In October 2000, the Gartner Research Group (GRG) touted its new 'ERP II' vision in 'ERP is dead, long live ERP II'. This serves as the only credible source of information on the (exact) subject. ERP II is an evolution from ERP that extends business processes, opens application architectures, provides vertical-specific functionality and is capable of supporting global enterprise-processing requirements (Zrimsek, 2003). Further, ERP II is a business strategy and a set of industry domain-specific applications that build customer and shareholder value by enabling and optimizing enterprise and inter-enterprise, collaborative operational and financial processes (GRG, 2000).

In elucidating the principal drivers behind the ERP II concept, Zrimsek (2003) draws upon the changes in the role and construction of the enterprise itself. The enterprise is perceived herein as the *supply chain* – a *virtual organisation* that if looked in entirety, is the provider of goods and services (as opposed to an isolated organisation). As individual firms focus on their core competencies, there is increased incidence of collaborative dependence. This in turn increases the need for B2B collaborative commerce or simply c-commerce between firms (Lee et al, 2003).

The quality of information shared should be high and in near real-time because the collaborating *real-time organisation* needs to make tactical decisions speedily for operational efficiency. Traditional ERP systems need further outward facing elements to facilitate this. This changes the entire value proposition of ERP that was an inward facing 'monolith' (Loh & Koh, 2004). Thus, the level of coordination and collaboration required places new value on business applications that enable the efficiency of the virtual, real-time enterprise. Furthermore, the *performance enterprise* delivers earnings, growth and efficiency. Many practitioners and vendors are turning to solutions for business intelligence and data warehousing to provide better information about enterprise performance. These new solutions are taking shape under the banner of corporate performance management (CPM). CPM is more than just software. It includes processes to manage corporate performance (such as strategy formulation, budgeting and forecasting), methodologies that may drive some of the processes (such as the balanced scorecard or value-based management), and metrics that assess performance against preset goals. Traditionally, ERP implementations treated the processes and metrics of CPM in silos, usually approaching them as afterthoughts or follow-on phases to the initial implementation. Conversely, ERP II enables CPM to be leveraged holistically (Zrimsek, 2003).

Zrimsek (2003) further warns that the path to ERP II will be more complicated and involved than that for ERP and suggest the following recommendations: Users seeking to adopt an ERP II strategy should do as shown in Figure 13.8.

Figure 13.8. Strategy for ERPII adoption

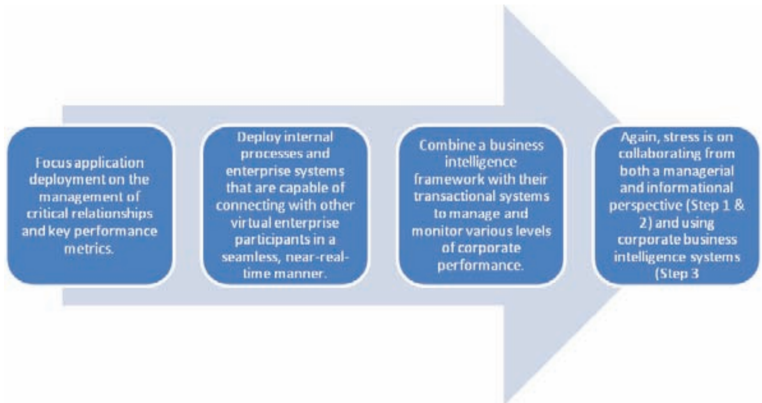


Exhibit 13.3.

<u>Mini Case – ERPII</u>

A world class manufacturing company is considering implementing ERPII. They are using SAP R/3 at presence. The driver for the move to ERPII is the need to share real-time information with partners in the supply chain. With the existing system, this cannot be done and even if 3rd party software is written to tackle systems incompatible issues, the converted information validity and accuracy will be questionable and out of date. Hence, this case company is now working closely with a number of key suppliers and customers in ERPII implementation. According to the case company, the most challenging issue does not lie in the technology, rather it is people, and it is convincing partners in the supply chain to take up this initiative that takes most of the energy. A clear information boundary and clauses in agreement have to be mutually agreed amongst all involved in ERPII implementation in order to ensure the right information is being accessed and used.

Industry analysts are cautiously optimistic in their reviews and perceptions of ERP II. While most acknowledge that the new business drivers, speed, adaptability, flexibility, and responsiveness would usher in ERP II, other authors disagree. Particularly damning is the article loosely coupled that unfortunately disparages ERP II only through examining failures of old ERP concepts (Hayler, 2003). The argument centres on one principal theme – standardisation 'fantasy', and suggests that ERP does not acknowledge diversity and imposes commonality where it does not make sense, and on this basis, the ERP II reimplementation needs are questioned. While this has been accepted as an essential component of ERP problems, this issue has been duly considered while defining ERP II. Zrimsek (2003) advocates vendors to provide products that are neutral regarding language, currency and statutory requirements and further suggest that from the monolithic architectures of ERP, [users] will create ERP II deployment strategies that best fit the needs of the enterprise without relying on a single vendor to deliver all application components. This reflects a lack of understanding, and a possible, lingering bias from earlier ERP experiences.

Supply Chain Management (SCM)

SCM Defined

Supply Chain Management (SCM) is the combination of art and science that goes into improving the way your company finds the raw components it needs to make a product or service, manufactures that product or service and delivers it to customers.

The following are five basic components for supply chain management (Figure 13.9).

Figure 13.9. Components of supply chain management

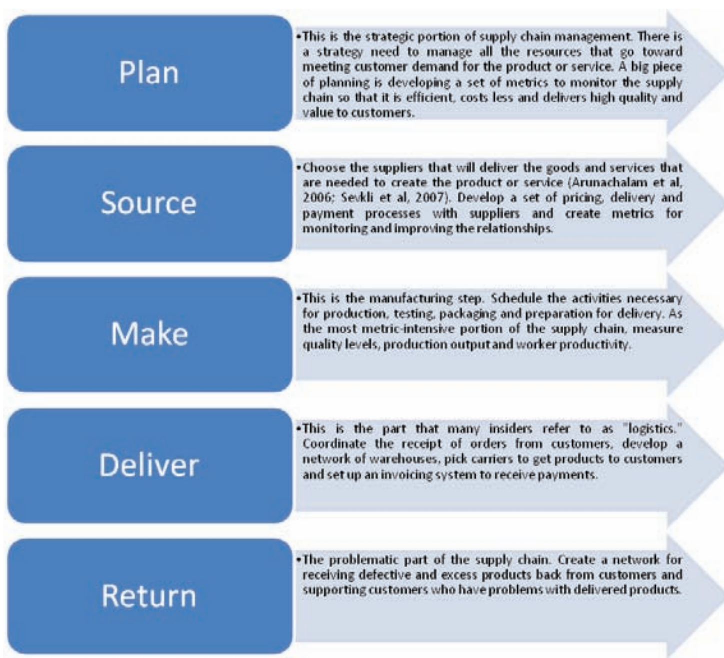


Exhibit 13.4.

Mini Case - Rolls-Royce

The existing supply chain cannot cope with the extending product range, increasing customer base and the increased competition. Therefore, they restructure their supply chain (because they are successful in their business) by introducing the supply chain restructuring programme in order to reduce cost and improve efficiency in the supply chain.

The supply chain restructuring programme is also the way that they manage their delivery of the 40 days engine and serve the aftermarket services.

Through the supply chain restructuring programme, there are several key processes and new systems that were introduced and implemented.

The Functions of SCM Software

Each of the five components of supply chain previously outlined composes several specific tasks, many of which have their own specific software. There are some large vendors that have attempted to assemble many of these different chunks of software together under a single roof, but no one has a complete package. Integrating the different software pieces together can be a challenge. The best way to think about supply chain software is to separate it into software that helps an organization plans the supply chain and software that helps them executes the supply chain steps themselves (see Figure 13.10).

Is ERP a Pre-Requisite for Implementing Supply Chain Software?

You may need ERP if you plan to implement SCP applications because they are reliant upon the kind of information that is stored in the most quantity inside ERP software. Theoretically you could assemble the information you need to feed the SCP applications from legacy systems (for most companies this means Excel spreadsheets spread out all over the place), but it can be cumbersome to try to get that information flowing on a fast, reliable basis from all the areas of the company.

Most CIOs who have tried to implement SCP applications say they are glad they did ERP first. They call the ERP projects "putting your information house in order."

Exhibit 13.5.

1. *Enterprise Resource Planning (ERP) implementation– they use SAP. This provides an integrated information system for the company in managing the ordering process, production planning and control and delivery, and finances. They have also started to use the maintenance module. This system enables a more up-to-date status checking of order and provides a more accurate purchase order to external suppliers and work order to internal suppliers to be released. With such order, suppliers could then plan their work accordingly in order to meet demand/order from Rolls-Royce.*
2. *Rolls-Royce Production Systems is another contributing factor in the supply chain restructuring programme. They streamline their supply chain and synchronise the flow of parts by implementing the pull signal (kanban) system. This provides a clear and visual update of parts to be ordered and pulled, hence minimising inventory level significantly. Internally in the company, they use Visual Square on the shop floor as a signalling protocol. Externally with their suppliers, the suppliers deliver complete pull kits and sub-assemblies directly to the point of use, hence minimising transport time/cost, inventory time/cost, reducing errors, improving quality and efficiency.*
3. *Through the supply chain restructuring programme, they are able to streamline their supplier chain by combining individual parts into build packages, hence minimising transaction time/cost and reducing the number of suppliers they have to deal with. This provides an economic of scale in terms of order management.*
4. *They train their suppliers (SMEs) and treat them as partners so that jointly a better delivery, quality and service could be maximised for the entire supply chain.*

Improvements, benefits and efficiency gains

e.g. Trent 500 engine,

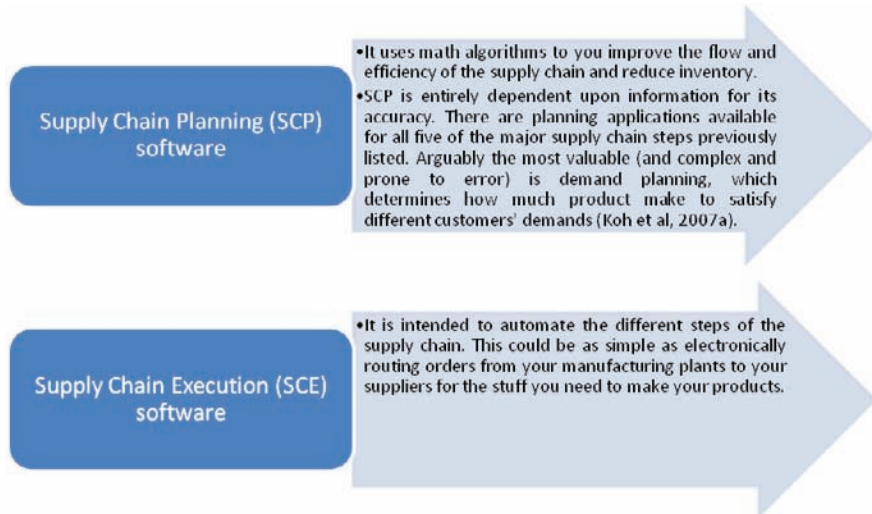
Before	***After***
3156 parts	*30 build packages*
34646 transactions	*15000 transactions*
152 suppliers	*60 suppliers*
£54 million inventory	*£35 million inventory*

Risks – and how they've been managed
In partnering with their suppliers, they adopt risk and revenue sharing method.

How long did it take to implement?
2-3 years. Originally planned as a 5-years programme. Due to market changes, this programme has ceased in 3 years.

How long did it take to get payback?
Approximately 18 months. However, it is difficult to measure because investment was made in parallel to a number of other initiatives.

Figure 13.10. Applications of supply chain



Of course, ERP is expensive and difficult, so you may want to explore ways to feed your SCP applications the information they need without doing ERP first.

SCE applications are less dependent upon gathering information from around the company, so they tend to be independent of the ERP decision (Koh et al, 2007b). But chances are, you will need to have the SCE applications communicate with ERP in some fashion. It's important to pay attention to SCE software's ability to integrate with the Internet and with ERP or SCP applications because the Internet will drive demand for integrated information. For example, if you want to build a private website for communicating with your customers and suppliers, you will want to pull information from SCE, SCP and ERP applications together to present updated information about orders, payments, manufacturing status and delivery.

The Goal of Implementing SCM Software

Before the Internet came along, the aspirations of supply chain software devotees were limited to improving their ability to predict demand from customers and make their own supply chains run more smoothly. But the cheap, ubiquitous nature of the Internet, along with its simple, universally accepted communication standards have thrown things wide open. Now, theoretically an organization is able to connect to the supply chain with the supply chains of their suppliers and customers together in a single vast network that optimizes costs and opportunities for everyone involved. This was the reason for the B2B explosion; the idea that stakeholders involve could be connected together into one big happy, cooperative family.

However, as discussed in pervious chapter, the implementation of ICT has been a difficult tasks taking consideration of various factors. However, considering that B2B has only been around for a few years, some industries have already made great progress, most notably consumer-packaged goods (the companies that make products that go to supermarkets and drug stores), high technology and autos.

Regardless of which industry sector of business within the supply chain, the main reason for them to initiate ICT is to archive visibility along the supply chain network.

The supply chain in most industries is like a big card game. Due to issue such as trust, supply chain players have difficulty in sharing information. However, if they are able to overcome the hurdle of trust, suppliers wouldn't have to guess how much raw materials to order, and manufacturers wouldn't have to order more than they need from suppliers to make sure they have enough on hand if demand for their products unexpectedly goes up. As a result, retailers would have fewer empty shelves if they shared the information they had about sales of a manufacturer's product in all their stores with the manufacturer. Although the Internet contributed significantly to other beneficial possibilities, however, centuries of distrust and lack of coordination within industries make it difficult.

Supply Chain Collaboration: Examples

Wal-Mart and Procter & Gamble

Before these two companies started collaborating back in the '80s, retailers shared very little information with manufacturers. Then the two giants built a software system that integrated P&G with Wal-Mart's distribution centres. When P&G's products run low at the distribution centres, the system sends an automatic alert to P&G to ship more products. In some cases, the system goes all the way to the individual Wal-Mart store. It enables P&G to monitor the shelves through real-time satellite link-ups that send messages to the factory whenever a P&G item past a scanner at the register.

With this kind of real-time information, P&G knows when to make ship and display more products at the Wal-Mart stores. This system integration removes the need to hold unnecessary products inventory in the warehouses Invoicing and payments happen automatically as well. The system saves P&G significant amount of time, reduced inventory and lowered order-processing costs that it can afford to give Wal-Mart "low, everyday prices" without putting itself out of business.

Exhibit 13.6.

Mini Case – Supply Chain Management

Wal-Mart and P&G, are the two consumer packaged goods suppliers that have made supply chain a household word. Back in the 80s, retailer shared very little information with manufacturers. Then, they built a software system that hooked P&G up to Wal-Mart's distribution centers. When P&G's products run low at the distribution centers, the system sends an automatic alert to P&G to ship more products. In some cases, the system goes all the way to the individual Wal-Mart store. It lets P&G monitor the shelves through real-time satellite link-ups that send messages to the factory whenever a P&G item swoops past a scanner at the register.

With this kind of real-time information, P&G knows when to make, ship and display more products at the Wal-Mart stores. It eliminates the need to keep products piled up in warehouses awaiting Wal-Mart's call. Invoicing and payment happen automatically too. The SCM system saves P&G a significant amount of time, reduced inventory and lower order-processing costs that it can afford to give Wal-Mart "low, everyday prices" without putting itself out of business.

Lessons: -

1. An effective and efficient synchronisation with your supplier or your customer via real-time information sharing would give competitive advantage to an enterprise. May this be order processing or inventory monitoring, such partnership and collaboration has proven to lead to time saving, cost reduction, inventory level reduction and improved customer service level.
2. Mutual trust is an important element in this kind of collaboration. The issue of information confidentiality needs to be arranged.

Cisco Systems

Cisco Systems, which makes equipment to integrate with the Internet, is also established for its supply chain collaboration. Cisco has a network of component suppliers, distributors and contract manufacturers that are linked through Cisco's extranet to form a virtual, just-in-time supply chain. When a customer orders a typical Cisco product for example, a router that directs Internet traffic over a company network-through Cisco's website, the order triggers messages to contract manufacturers of printed circuit board assemblies. Distributors, meanwhile, are alerted to supply the generic components of the router, such as a power supply. Cisco's contract manufacturers, some of whom make subassemblies like the router chassis and others who assemble the finished product, already know what's coming down the order pipe because they have logged on to Cisco's extranet and linked in to Cisco's own manufacturing execution systems.

Soon after the contract manufacturers reach into Cisco's extranet, the extranet starts poking around the contractor's assembly line to make sure appropriate work is in the process . Factory assemblers slap a bar code on the router, scan it and plug in cables that simulate those of a typical corporate network. One of those cables is a fire hose for Cisco's automated testing software. It looks up the bar code, matches it to a customer's order and then probes the nascent router to see if it has all the ports and memory that the customer wanted. If everything checks out-and only then-Cisco's software releases the customer name and shipping information so that the subcontractor can get it off the shop floor.

Cisco's network was designed to handle the company's huge growth. Distributed decision making is great if the decisions have mostly to do with making and selling more things. But Cisco and its network were caught completely off guard by the recent tumble in the economy. It took awhile to turn all the spigots off in its complex network when demand for its products plummeted and Cisco and its supply chain partners got stuck with a lot of excess inventory-as did most other big manufacturers in high technology. Cisco was forced to take a hard look at its supply chain planning capability. SCP software is much better at managing growth than it is at monitoring a decline and correcting it. It is important to recognize that SCP software is not a panacea, but an enabler to assist organization in supply chain planning.

The Constraints of Implementing Supply Chain Software

- **Gaining.trust.from.your.suppliers.and.partners:.**Supply chain automation is uniquely difficult because its complexity extends beyond your company's walls. Your people will need to change the way they work and so will the people from each supplier that you add to your network (Gunasekaran et al, 2004; Dimitriadis and Koh, 2005). Only the largest and most powerful manufacturers can force such radical changes down suppliers' throats. Most companies have to sell outsiders on the system. Moreover, your goals in installing the system may be threatening to those suppliers, to say the least. For example, Wal-Mart's collaboration with P&G meant that P&G would assume more responsibility for inventory management, something retailers have traditionally done on their own. Wal-Mart had the clout to demand this from P&G, but it also gave P&G something in return-better information about Wal-Mart's product demand, which helped P&G manufacture its products more efficiently. To get your supply chain partners to agree to collaborate with you, you have to be willing to compromise and help them achieve their own goals.

- **Internal.resistance.to.change:.**If selling supply chain systems is difficult on the outside, it isn't much easier inside. Operations people are accustomed to dealing with phone calls, faxes and hunches scrawled on paper, and will most likely want to keep it that way. If you can't convince people that using the software will be worth their time, they will easily find ways to work around it. You cannot disconnect the telephones and fax machines just because you have supply chain software in place. The users of SCM systems are workers at organisations in the supply chain. SCM projects usually modify the business processes within the company, the business processes at suppliers, partners and distributors (Sevkli et al, 2007). Users may not think that the work methods embedded in the software are better than the ones they currently use. Ongoing end-user involvement and training may ease the difficult of adopting new systems and new processes.
- **Many mistakes at first:** New supply chain systems process data as they are programmed to do, but the technology cannot absorb a company's history and processes in the first few months after an implementation. Forecasters and planners need to understand that the first bits of information they get from a system might need some adjustments. If they are not warned about the system's initial inflexibility, they will think it is useless. In one case, just before a large automotive industry supplier installed a new supply chain forecasting application to predict demand for a product, an automaker put in an order for an unusually large number of units. The system responded by predicting huge demand for the product based largely on one unusual order. Blindly following the system's numbers could have led to inaccurate orders for materials being sent to suppliers within the chain. The company caught the problem but only after a demand forecaster threw out the system's numbers and used his own. That created another problem: Forecasters stopped trusting the system and worked strictly with their own data. The supplier had to fine-tune the system itself, and then work on re-establishing employees' confidence. Once employees understood that they would be merging their expertise with the system's increasing accuracy, they began to accept and use the new technology.
- **Failure.in.accommodating.evolution.of.business.processes:.**Inventory cost counts 50% or more of total cost in manufacturing and retailing industry. Supply chain management offers the promise of drastically reducing the inventory cost. A SCM system fails if it can't accurately forecast the product demand (Koh & Tan, 2006a; Koh & Tan, 2006b). A textbook case in failure of demand forecasting was the failure of Cisco's supply chain system when Cisco announced it would scrap $2.5 billion of surplus raw materials on April 16, 2001. Business processes within an organisation fall into three levels - strategic planning, management control and operational control. Much of ERP and

CRM successes have been in the integration of activities within organisations (Gunasekaran & Ngai, 2004; Koh et al, 2006a). SCM has to deal with issues at strategic planning level. Organisations continuously realign their business processes to response to an ever-changing market environment. Many SCM systems are not flexible enough to accommodate the emergence of customers' new needs, changes at suppliers and distributors and the evolution of internal business processes (Gunasekaran & Ngai, 2004; Koh & Tan, 2006a; Koh & Tan, 2006b).

Failure in SCM Software Implementation

The core of an SCM system is supply chain software, which is module-based application. Many SCM projects involve significant amount of customisation. Time-consuming and expensive customisation efforts often lead to the pass of release deadline and budget overrun. Extensive customisations make the software more fragile and harder to maintain when it finally goes to production. Major changes may be required in the later stage of the implementation as a result of incomplete business and technical requirements and power struggles within and across organisations.

- **Failure.in.SCM.systems**: The failure of SCM systems is not the common cause of SCM project failure. Organisations may mismatch SCM software selected with their business requirements due to the lack of experience in SCM software selection and the push from particular SCM software vendors.

Critical Success Factors of Supply Chain Software Implementation

- **Project.planning:** Project planning involves setting project goals, identifying high level business requirements, establishing project teams and high level project estimates (Wickramatillake et al, 2007).
- **Architectural. design:.** While high-level architectural decision is made as part of the process of choosing a Supply Chain Software vendor, it remains as a critical successful factor when integrating Supply Chain Software with particular existing information system. Make sure your Supply Chain Software plans include a scalable architecture framework (Wickramatillake et al, 2007).
- **Phased.approach:.** It is important to break your Supply Chain Software project down into manageable pieces by setting up pilot programs and short-term milestones. Dependent on the IT experience, some organizations choose the

easiest application as the pilot project, while others implement a mission-critical application first to ensure the overall success of supply chain. The pilot project can demonstrate the benefits of Supply Chain Software to motivate all the necessary participants to fully commit to the project (Wickramatillake et al, 2007).

- **Data.gathering:.**The start point of data gathering is to focus on the data necessary for your business decision-making and to logically derive other data requirement. Lack of sufficient data will lead to the failure in one way, while gathering and storing excessive and necessary data will result cost overrun and delay of system deliver (Wickramatillake et al, 2007).
- **Overcome.internal.resistance.to.change:.**Operations staff is accustomed to dealing with phone calls and faxes. If employees are not convinced that using the software will be worth their time and not threaten their jobs, they will easily find ways to resist it. At the initial implementation phase of supply chain, the software systems may not demonstrate its full potential, sometime may even behaviour irregularly. It is important to educate employees about the evolving nature of supply chain software (Gunasekaran et al, 2004; Dimitriadis & Koh, 2005; Wickramatillake et al, 2007).
- **Gaining.trust.from.suppliers.and.distributors:** Supply chain automation is uniquely difficult because its complexity extends beyond an organization's boundary. It will change the way how people work at suppliers, distributors and other partners as well. Large manufacturers have more powers to impact the change on external business entities in the supply chain (Gunasekaran et al, 2004; Dimitriadis & Koh, 2005; Wickramatillake et al, 2007).

Business-to-Business (B2B) Exchanges' Supply Chain Software

Business.to.Business.(B2B) refers to electronic trade or partnering between organizations. The volumes of B2B transaction is estimated to be counted about 90% of ecommerce transaction, while **Business-to-Consumer.(B2C).**takes about 10% of e-commerce activity. Many B2B exchanges offer functionality for managing procurement of row materials and coordinating with suppliers. Speculating of B2B market had driven the stock prices of B2B software providers (such as Ariba) to sky-high in 2000. Public B2B exchanges have not lived up to their original ambitions. Today, many companies use both public B2B exchanges and their private supply chain management software for procurement.

Public (many-to-many) B2B exchanges and private (you to everyone else in your supply chain) exchanges began with grand promises of auctions and procurement savings for members, but few suppliers were tempted. Since then, most of these websites have morphed into becoming online hosts for supply chain software.

- **Advantages. and. disadvantages. of. public. B2B. exchanges:.** Public B2B exchanges often have more suppliers participating in. Companies have more options to select the suppliers that fit in their business needs, and they also have more power in negotiating the prices and terms of services. The cost of participating in a public exchange is significantly lower than implementing your owner SCM systems. The disadvantages of public B2B exchanges are lack of customisation and limited supplier participants in a specific industry. Both industry-specific business requirements and company-specific business models dominate the processes of procurement. While public B2B exchanges usually have features for supporting common procurement, they have very little to offer to support procurement processes in particular industry.
- **Advantages.and.disadvantages.of.private.SCM.systems:.** Private supply chain management software, on the other hand, is tailored to specific industry and particular company. SCM systems are often tightly integrated a limited few suppliers and trading partners. The purpose of SCM is more of collaboration than price negotiation. The disadvantage of private supply chain software, compared with public B2B exchanges, is the cost of implementation. Many small companies that could not offer an implementation of private SCM systems will use B2B exchanges for their supply chain management.
- **Strategies.of.e-procurement:.** To get the most out of supply chain management software and public B2B exchanges, large organisations have both of them in place. They use B2B exchanges for the procurement of commonly used materials, and use private SCM systems for collaboration with the suppliers and trading partners who are industry-specific. The public exchanges, with their independence and neutrality, may eventually attract more buyers and suppliers together in one place. Before that happens, companies will continuously build private exchanges in their supply chain management systems.

  For small companies that can't afford to buy the software on their own, the public exchanges will probably be their source. But for now many of the offerings are immature and aren't getting much use. Companies that can afford to are building their own private connections with their trading partners online rather than going through public exchanges. The ambitious public exchanges, with their independence and neutrality, hold out the hope of attracting more buyers and suppliers together in one place, but the level of specificity of a public exchange's supply chain software will probably never reach the depth that a company could build with a select few suppliers in a private exchange. So most decision makers are saying they will use public exchanges for the generic supply chain connections they make, and build their own for the really strategic deep, supply chain relationships they have.

Leading SCM Vendors

All major supply chain vendors (Microsoft, Oracle, SAP, PeopleSoft) offer their supply chain products in Enterprise Version and Web Based supply chain version. Many small supply chain vendors focus exclusively on providing Web-based or online supply chain solutions. Table 13.5 shows examples of some leading SCM vendors.

Table 13.5. Leading SCM vendors

Names.of.vendor.and.software	Target	Size.of.enterprise
Ariba – Spend Management Solutions - Procurement, Supplier Management, Sourcing, Strategy, Visibility, Managed Services.	Ariba Spend Management Solutions help organisations to compete through speed, sustainability and coverage. Industries: consumer products, energy, financial services, high technology, manufacturing, pharmaceutical, public sector and higher education and telecommunications, and transportation.	Large
Apriso - FlexNet	Web-based collaborative manufacturing and supply chain execution solution.	Large
i2 Technologies - SCM Solution Suite	Collaborative Demand Planning, Collaborative Supply Planning, Service Management and Supply Chain Execution.	Large
Ross Systems - iRenaissance SCM	For manufacturers in the food and beverage, life sciences, chemicals, metals and natural products industries, Ross Systems delivers innovative solutions that help manufacturers fulfil their business objectives through increased efficiencies, improved financial controls, strengthened customer relationships, and streamlined regulatory compliance. Solutions include demand planning, manufacturing, inventory management, quality control, financials, supply chain management, customer relationship management, and regulatory compliance.	Medium-Large

continued on following page

Table 13.5. continued

Epicor Software - Vantage	Vantage by Epicor is an integrated, comprehensive enterprise resource planning (ERP) software solution designed specifically for make-to-order and mixed-mode manufacturers. Vantage enables you to achieve operational efficiency throughout your company. It combines advanced technology with robust functionality to provide an end-to-end enterprise wide solution, including: comprehensive scheduling capabilities, fully integrated relationship management solutions, extensive business intelligence tools, and advanced material management capabilities.	Medium-Large
IMI - IMI SCM	IMI provides performance driven supply chain solutions for the retail value chain. The company helps leading CPG manufacturers, wholesalers, retailers and logistics services providers automate, streamline and optimise distribution based on actual customer demand. IMI offers proven solutions in warehouse, order, and trading partner management, fulfilment, analytics and supply chain planning. IMI solutions are used by the worlds leading companies.	Medium-Large
Adexa - iCollaboration	Supply Chain Planning, Product Development Planning, and B2B Collaboration software tools.	Medium-Large
Aplicon Solutions - TradCOM	Supply chain portal software application that enables collaboration, execution and event management.	Medium-Large
Manugistics Group - Manugistics Supply Chain Management	Manufacturing planning and scheduling, operations planning, fulfilment management, logistics management.	Medium-Large
SupplyChainge - ChaingeAgent	Optimises supply planning; harnesses demand risk associated with short product lifecycles and long order lead times.	Medium
Transentric - Supply Chain Solutions	Provides electronic connectivity and inventory visibility for supply chain and transportation managers.	Medium
Tracksys Technologies - TRACKsys SCM	Supply chain management system with automated data capture for agribusiness.	Small-Medium
Bellwether Software - Purchasing Management eXtra	e-Procurement and supply chain management software that automates your purchasing process in a purely paperless mode.	Small-Large

CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

CRM Defined

Customer Relationship Management (CRM) is a strategy used to learn more about customers' needs and behaviours in order to develop stronger relationships with them. After all, good customer relationships are at the heart of business success. There are many technological components to CRM, but thinking about CRM in primarily technological terms is a mistake (Maguire et al, 2007). The more useful way to think about CRM is as a process that will help bring together lots of pieces of information about customers, sales, marketing effectiveness, responsiveness and market trends.

Examples of the types of data CRM collects include:

- Responses to campaigns
- Shipping and fulfilment dates
- Sales and purchase data
- Account information
- Web registration data
- Service and support records
- Demographic data
- Web sales data

The Goal of CRM

The idea of CRM is that it helps businesses use technology and human resources to gain insight into the behaviours of customers and the value of those customers (Lee et al, 2007). If it works as expected, a business can:

- Provide better customer service
- Make call centers more efficient
- Cross sell products more effectively
- Help sales staff close deals faster
- Simplify marketing and sales processes
- Discover new customers
- Increase customer revenues

The Process of CRM

For CRM to be truly effective an organisation must first decide what kind of customer information it is looking for and it must decide what it intends to do with that information (Maguire et al, 2007). For example, many financial institutions keep track of customers' life stages in order to market appropriate banking products like mortgages or IRAs to them at the right time to fit their needs.

Next, the organisation must look into all of the different ways information about customers comes into a business, where and how this data is stored and how it is currently used. One company, for instance, may interact with customers in a myriad of different ways including mail campaigns, Web sites, brick-and-mortar stores, call centers, mobile sales force staff and marketing and advertising efforts. Solid CRM systems link up each of these points. This collected data flows between operational systems (like sales and inventory systems) and analytical systems that can help sort through these records for patterns. Company analysts can then comb through the data to obtain a holistic view of each customer and pinpoint areas where better services are needed. For example, if someone has a mortgage, a business loan, an IRA and a large commercial checking account with one bank, it behoves the bank to treat this person well each time it has any contact with him or her.

The Need of CRM

One way to assess the need for a CRM is to count the channels a customer can use to access the company. The more channels you have, the greater need there is for the type of single centralised customer view a CRM system can provide.

CRM Implementation Lead-Time

Some vendors claim their CRM solutions can be installed and working in less than a week. Packages like those are not very helpful in the long run because they do not provide the cross-divisional and holistic customer view needed. The time it takes to put together a well-conceived CRM project in fact depends on the complexity of the project and its components. On average, it takes about 6 to 12 months, depending on the complexity.

Cost of CRM

A 2001 survey of more than 1,600 business and IT professionals, conducted by The Data Warehousing Institute found that close to 50% had CRM project budgets of less than USD 500,000. That would appear to indicate that CRM does not have to

Exhibit 13.7.

<u>Mini Case – Customer Relationships Management</u>

AGF is one of the largest financial services organisations in France. With its wide network of partners, it leads the industry in the delivery of products and services through a variety of channels. In 1995, AGF became a pioneer in the insurance sector, building the first insurance-focused web site, to enable faster communication with customers and partners. When AGF and the Allianz Group merged, the company's presence on the Internet spread very rapidly and AGF has maintained its leadership with online CRM solutions that support both its direct and channel sales efforts.

The results speak for themselves. They achieved a 100% availability of the site, more than 4000 visits per day, 1000 quotations per month, 150 new contracts every month, 80% of fully comprehensive contracts and 95% of contracts are paid online. They linked up with 700 agent sites online, including more than 100 customised sites. This allows information upload and download easily between agents. Online claims management will soon be available.

Note: A total of 31.5 million US households will be banking online by the end of 2005. By 2007, young, affluent Internet users (adults age 24 to 35 with household incomes of USD75000 of higher) will number more than 30 million. Currently 48% of that group views bills online and 44% pay bills online (source: eMarketer & Jupiter Research, 2002).

Lessons: -

1. *It is vital for an enterprise to be able to recognise quickly at the early stage the type of technology that will be robustly applicable for them in the long run. The clue can be found from your day-to-day business activities, changes in your enterprise and the movement of leading IT vendors.*

be a budget-buster. However, the same survey showed a handful of respondents with CRM project budgets of over USD10 million.

Critical Success Factors for CRM Implementation

- **Decomposition:** Break your CRM project down into manageable pieces by setting up pilot programs and short-term milestones. Starting with a pilot project that incorporates all the necessary departments and groups that gets projects rolling quickly but is small enough and flexible enough to allow tinkering along the way.

- **Architecture framework:** Make sure your CRM plans include a scalable architecture framework.
- **Data collection:** Don't underestimate how much data you might collect (there will be LOTS) and make sure that if you need to expand systems you'll be able to. Be thoughtful about what data is collected and stored. The impulse will be to grab and then store EVERY piece of data you can, but there is often no reason to store data. Storing useless data wastes time and money.
- **Individuality:** Recognise the individuality of customers and respond appropriately. A CRM system should, for example, have built-in pricing flexibility.
- **Communication:** Lack of a communication between everyone in the customer relationship chain can lead to an incomplete picture of the customer. Poor communication can lead to technology being implemented without proper support or buy-in from users. For example, if the sales force isn't completely sold on the system's benefits, they may not input the kind of demographic data that is essential to the program's success.
- **Business alignment:** The biggest returns of implementing CRM come from aligning business, CRM and IT strategies across all departments and not just leaving it for one group to run (Lee et al, 2007).

Industries Leaders and Laggards in CRM Implementations

As in most leading-edge technology implementations, the financial services and telecommunications industries set the pace in CRM. Other industries are on the CRM bandwagon include consumer goods makers and retailers and high tech firms. Heavy manufacturing is behind.

Leading CRM Vendors

According to the Gartner Group, the leading CRM vendors of specialist applications are listed below:

- Siebel Systems
- E.piphany
- PeopleSoft
- Oracle
- SAP
- Amdocs
- Chordiant Software
- Aprimo

- SmartPath
- Veridiem
- Elateral
- Unica
- Accenture
- IBM

FUTURE TRENDS AND CONCLUSION

The advancement of ICT development and its wide spread diffusion in businesses suggest that any enterprise and supply chain could improve their efficiency and competitiveness through ICT adoption. This ICT includes ERP, SCM and CRM systems. The greater is the need of information sharing and exchange and collaboration in supply chains, the higher is the importance of successful ICT adoption.

Increased globalisation of today's supply chain makes ICT adoption a much greater challenge. It is undoubtedly not sensible to isolate these systems in the long run due to potential lost of speed and accuracy advantages over those offered by competitors. However, it is equally important for an enterprise to remain agile in managing the supply chain. Hence, the future ERP, SCM and CRM systems should improve their services on the following abilities: agility, responsiveness, easily modularizable, easily integratedable, easily implementable and easily absorbable.

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Chapter XIV
E-Technology:
E-Business, Intranet, Extranet, Internet

Globalisation, modernisation and streamlining paradigms have driven many enterprises to use various e-Technologies in order to improve the performance of existing operations, and compete globally and strategically to enhance manufacturing enterprise competitiveness, which in today's digital economy, is often networked and interconnected via the Internet, Intranet, and Extranet. Examples of the e-Technology include e-Commerce, e-Business, e-Procurement and e-Logistics. These technologies are in place to support the notion of establishing a value-added e-Supply chain and e-Demand chain. The support of back-office systems, e.g. Supply Chain Management (SCM), Manufacturing Resource Planning (MRPII), Enterprise Resource Planning (ERP) are crucial to enable seamless information flow in the supply chain, whilst support from front-office systems, e.g. Customer Relationships Management (CRM), is important to coordinate the demand chain. Appropriate alignment of the e-Technology with the systems is expected to create further competitive advantages. Hence, e-Technology is a core competence in contributing to competitiveness in the digital economy. It is not merely a facilitating enabler, but a critical enabler towards globalization. (Ketikidis et al, 2006)

E-TECHNOLOGY DEFINED

Electronic-technology (E-technology) covers a diverse range of IT, IS, IT/IS and ICT used with the network architecture support of the Internet, Intranet and/or Extranet to assist personal, business, organisational and institutional activities. This ranges from the basic e-technology such as e-mail, to the intermediate one, such as an integrated payroll system (e.g. ERP), to the advanced e-technology, such as e-commerce or e-business.

It is out of the scope of this chapter to discuss the basic e-technology. The intermediate e-technology has been discussed in the previous chapter. This chapter will focus on the advanced e-technology.

What is E-Business?

There is a no universally accepted definition of e-business. Consequently the term e-business is used interchangeably (Fillis, 2003) and/or is mistaken (Lawson et al, 2003) with the term e-commerce and other related phrases. E-business means different things to different people (Searle, 2001), and the term has been variously defined. To make the term e-business clearly understood, in this book we adopted the definition from Kalakota & Robinson (2001).

E-business is the combination of strategies, technologies and processes to electronically coordinate both internal and external business processes, and manage enterprise-wide resources (Kalakota & Robinson, 2001). Chiu et al (2007) presented a common gateway service model for electronic business supply chain based on RosettaNet Standards. A prototyping system compliant with the model presented is built and installed as a gateway interface of digital firms and seamlessly integrate to the firm's backend information system to conduct the message exchange with its business trading partners. The result of experimental implementation in a firm's supply chain system shows that the service model can really assist the firm to streamline its flow of business data and create a higher value of supply chain with its suppliers in this digital era. Pavic et al (2006) examine what is needed for the transition of SMEs from an "old" traditional business strategy to a new "e" business strategy. The findings indicate that it may be possible for SMEs to integrate the Internet technology into an overall strategy and that this new technology could become a force for creating a competitive advantage. However, owners' attitudes towards new technology, the knowledge and skills of management and the workforce are recognised as potential problematic issues.

E-Business Models

The emergence, growth, globalisation and interest in the Internet technology have resulted in the creation of various e-business models relating to Internet strategies. Afuah and Tucci's (2001) framework offers strategies and tactics for this new electronic era and is valuable for both researchers and managers trying to make sense of this new world. Jelassi & Enders (2005) take a more classical approach, applying the ideas of Michael Porter (1985). Only by integrating the Internet into an overall strategy will this powerful new technology become an equally powerful force for competitive advantage (Porter, 2001).

The MIT90 Framework is a model that uses IT based capabilities of the organisation (Scott Morton, 1995). In this model, an organisation can be viewed as being composed of five interrelated components: management processes, structure, strategy, technology, individuals and roles. These components closely interact with one another and so changes to any of the components will require changes to the others to bring their objectives and activities back into alignment. This framework was originally developed to guide organisations through their adoption of IT as an organisational and strategic resource from their computer automated environments (i.e. data processing, automated reporting, computer integrated manufacturing, etc.). This was done in the context of the traditional business model (Pavic et al, 2007).

A Framework for moving to an e-business model was developed by Chen & Ching (2002). This model is based on the MIT90 framework and its purpose is to guide the successful transition from a traditional organisation to an e-business model. In this model it is suggested that all aspects of organisational operations must be synchronised and co-aligned. The authors suggest that the organisation needs to first change its strategy and technology, which is in-line with the ideas of Scott Morton (1995). The authors believe that this will determine the structure, management process, individuals and roles. They draw upon resource-based theory, which will bring sustained competitive advantage to the organisation. However this model does not take into consideration the owner/managers attitude towards change, organisational readiness and stages of adoption, external pressure, size and age, IT skills and knowledge, and so on. Pavic et al (2007) identified that this is a major limitation of the approach by Chen & Ching (2002).

A conceptual model of e-business development has been developed by Fillis, Johansson and Wagner (2003). This conceptual model attempts to consider how a range of internal and external factors influence attitudes towards e-business, as well as its implementation as part of the company's business strategy. Factors considered in the model are: Macro-factors, Industry/Sector factors and Firm/Managerial factors. However, this model does not suggest when structural changes will occur and what will happen at the macro level, industry level and firm level. In reality it only presents barriers and benefits of e-business adoption rather then the sequence of events that could lead to success (Pavic et al, 2007).

Pavic et al (2007) show that SMEs need to create and implement a plan that allows them to make the transition from an old system to a new, e-business organisation. They developed an e-business model and it **i**s regarded as an adaptable solution where a company with an old legacy system uses existing IT applications and builds upon them at their own pace. This way companies with or without external financial support (e.g. provided by the Government) can minimise risks associated with developing an IT enterprise requiring expensive planning and investment. Pavic et al (2007) identify two critical areas in a traditional value chain, which supports theories and models on a reversed value chain (Poon & Swatman, 1999; Kalakota & Robinson, 2001; Daniel, 2003), and this could lead to an innovative method to e-business modelling by interlocking traditional value chain with e-value chain.

A Double-Edged Sword?

The Web has the advantage of being able to communicate to customers, deliver product and service customers on a *24/7/365* basis. The Internet can deliver e-services/e-products in the form of mailing list, stats, a report, an online course— or content — stock footage, e-books, e-tickets for planes and movies, software, games, music such as the new iTunes service launched by Apple. For some companies and their customers, the Internet is the entire channel and the whole relationship exists over the Web. This is termed the e-organisation (Azumah et al, 2005).

Just as we can gain insight by looking backwards, we can discover lessons in what is going on around us today. Among the current lessons are:

- **The. Web. at. your. service:** E-business lends itself to a self-service model. This has been successfully applied in B2C (e.g., Amazon, Ebay, Dell). There are still opportunities to create this in B2B, where employees and customers can fulfil business requirements when and how they want.
- **Small. businesses. poised. to. explode:** Seventy percent of America's small businesses (defined as those with less than 250 employees) do not have a Web presence, according to an October 2002 report from the Small Business Administration. For bigger organization, small businesses have the potential of becoming new clients, and, through partnerships, also providing access to niche customers. They can act as a virtual sales force, extending a company's reach to better serve these customers. For example, Ebay, is an innovator in this area and has become so successful with its power sellers that it is able to offer health insurance to them. New concepts such as this will proliferate in the future.

- **Increases. in. international. community. and. competition:** Although U.S. has been the leader in adoption of Internet among businesses but the focus has been shifted to Latin America to India where there countries are poised to compete for business internationally. Internet adoption has enable supply chains to be integrated to get better economies of scale. By getting to know and understand their customer, critical success factors such as differentiation and competitive advantage will be achieved.
- **Face.challenges.with.partners:.**One of the challenges that businesses face is gaining the trust from customers in a 24/7 world. New innovative approaches are essential in the process of forging partnerships, outsourcing services to experts and developing relationships with international to attain and achieve company business goals. Issues such as protecting intellectual property and copyright laws will continue to be a critical issue because of the virtual communication and information in the Internet. In order to overcome obstacle in the process of IT implementation, organization has to adapt to new thinking and approach such as developing flexible, adaptable resources, both from the physical and human perspective. The new e-organisation, which includes its partners, must be globally aware, system-oriented and customer sensitive oriented. In order to succeed, organization has to become a moving target by constantly differentiating itself such as responding proactively to customer feedback and develop products and services that create loyalty.

What Kind of Revenue Opportunities Does E-Business Create?

- **Increased.of.market.share.globally:** A business, whether it is a B2C or B2B business, can increase its revenues by selling its products and services to a larger number of customers without any geographical boundaries. With the advancement of Internet technology and innovative way of communication, businesses would be able to gain new sales channels, new geographies and new customer segments globally.
- **New.sales.channels:** Businesses can take the advantages of gaining new sales channels using the Internet technology. There are few alternative for selling online. A common form of online channel is the online "shop." Within the online shop the customer may browse the company's products and services, learn more about them, understand options and features, and ultimately place an order. Some companies strive for a mix of "bricks and clicks." Buyers will have the options to use the online channel to gain more information and understanding of the product before buying the products at physical stores. Online channel give more flexibility to buyer in terms of information, selection and the time factors. Therefore is it essential for businesses to

achieve an optimal integration [of its online store] with the [physical] store." There are still many companies that utilise this channel instead of having retail storefronts. One of the good examples is consumer electronics companies such as Palm. These companies typically have no dedicated retail storefronts and work through regular retail stores. This enable the business to access to customers are not near the retail stores or who live in areas not served by a broad variety of retail establishments.

- **Extended geographic reach:** Online commerce gives a competitive advantage to penetrate to a new geographic territory. Regardless of businesses type and size, they can utilize the online sales sites to sell on a worldwide basis with minimal cost. This ability to tap into expanded domestic or even international markets can be an immediate revenue boost to artists, jewellery makers, wineries and the like, for initial orders and especially for reorders. Also, by introducing a website with English language options, it will significantly extend its geographic reach.
- **Enhanced sales to existing customers:** With the advancement of technology, it has been possible for business to combine with electronic connectivity to the customer using some sophisticated techniques to pull additional sales from their existing customer base. One of the common tools used is CRM and data base systems. CRM and data mining systems (see data mining in this series) allow companies not only target a broad range of customers with common buying characteristics, but to narrow the target down to the individual buyer. Targeted e-mail, for example, is far more effective than broadcast e-mail. Companies such as Amazon.com do has utilize such capability of suggesting choices to customers based on past product purchases. In the B2B world, once the effort and expense has been expended to electronically connect companies, the convenience and efficiency of doing business together will enhance sales and make switching more difficult.
- **Electronically enabled products:** A major source of new revenues has come from **digital products and services**:
  - *Digital content*:The Internet is well suited to the delivery of digital content to a customer. This content ranges across music, movies, photos, news and information, interactive multiplayer games, books, magazines, and almost anything else that can be digitised. Revenues may come from pay per use or subscriptions. Purchase for download is also another major revenue source that is likely to grow in the future. Downloadable entertainment such as CDs, DVDs and video games has significant potential for revenues once copyright issues have been resolved. With broadband connectivity, a whole new world of revenue opportunities is appearing, just in the entertainment area alone.

Exhibit 14.1.

Mini Case 1 – Gripple Ltd

Gripple Ltd is a Sheffield UK based manufacturing company founded in 1988. The company employs 147 people and had a turnover of £14.6m in 2004. The "Gripple" is a device invented by the chairman of the company and is recognized as the world's most innovative way of joining, tensioning, terminating and suspending wire and wire rope. Most of their products are exported and they have a number of sales offices and agencies around the world but all manufacturing takes place in Sheffield. The company is strategically driven and highly innovative in applying the latest manufacturing technology to new products. Innovation through new product development has remained the core of the company's successful strategy. Due to strategic and operational positioning, the company invested in technology right from the beginning. Now, the company has an Enterprise Resource Planning/Just-in-time (ERP/JIT) system, and has a very strong Research and Development (R&D) department. Their latest technological investment is in a novel "Loadhog" (a re-usable device for securing boxes to a pallet instead of shrink wrap plastic). This forward thinking strategy and investment in the appropriate IT infrastructure has opened a wide global market to the company. In terms of ICT, the company is successfully using e-mails as an efficient internal and external communication tool, a web site which positions them in the worldwide market, and e-commerce where they are able to order and pay online and maximise accessibility and speed. Nevertheless, the company is disadvantaged in the area of supply chain integration with other companies whose owners/managers are lacking the same enthusiasm for IT investment and are preventing Gripple from achieving full e-business integration. For example, the company's managers still need to use a telephone and fax machine to make sure that final material orders and deliveries are taking place as planned. This is due to a high percentage of human errors experienced in the past and the lack of appropriate IT infrastructure in their suppliers. To complete the supply chain Gripple Ltd may need to help their business partners (suppliers and customers) by defining hardware/software/Internet service provider configurations, which would consequently emphasize the importance of close relationships between supply chain partners as a prerequisite to adopting e-business. In particular, the company may need to initiate the building of an electronic Business2Business (B2B) and Business2Customers (B2C) relationship. These can be realised by using an Extranet that enables the company to share part of the business's information or operations with suppliers, vendors, partners, customers, or other businesses. This will enable business partners to develop a real appreciation of the power of the Internet.

Source: Pavic et al (2006)

- *Digital services:* Online digital services have proven to be a successful source of e-business revenues. For example, Kodak, as well as others, offers services that allow customers to deliver their electronic photos via the Internet and receive high-quality prints back via regular mail. Prices are highly competitive with local photo processors. Sites such as eBay and travel services such as Travelocity, Priceline.com and others generate revenues by charging small commissions on each transaction. Similarly, a large number of online casinos (primarily based outside the

Exhibit 14.2.

Mini Case 2 – SMP Europe

SMP Europe is a Yorkshire UK based motor vehicle parts manufacturing company with 250 employees and a turnover of £15m in 2004. SMP Europe was trading under a different name until 1996. The original company was formed in 1967. The company expanded gradually over the years. However, their main products were copies of original motor vehicle parts and the company performance had reached a peak and business had started to decline in the early 1990s. Thus, the company went from winning to losing rather quickly, as they did not have the ability to generate new value added through innovation. They also ignored rapid advances in technology and their rather outdated computers brought a previously very successful company to a standstill. The control of the company was poor, with low efficiency and high production costs. Lack of investment in better technology and the declining stage of the industry life cycle (producing copies of original parts) forced the owner of the company into a joint venture with a firm in the USA. However, 1996 SMP Europe took back a controlling interest in the original firm and they are now a wholly owned subsidiary. In 1999 the owner of the company realised that their future was in innovation rather then in making copies. As a result another company was acquired. This positioned SMP Europe as a manufacturer with an innovative marketing approach. Moreover, in 2002 they invested £1m in a new IT infrastructure. Due to a previously poor IT infrastructure it took 18 months for the company to come back to where they started from before the IT upgrade. They also invested in staff training, a new telephone system, a new Enterprise Resource Planning system (ERP) and a new customer database. These investments were only a start for the company in terms of e-business applications. They are now willing to learn from their mistakes and try to keep up with the latest technological advances in the future.

Source: Pavic et al (2006)

United States) offer a full range of casino gambling to customers worldwide with the house in each case taking its usual share of the money wagered.

BUSINESS-TO-BUSINESS (B2B)

B2B Defined

B2B stands for "business-to-business," as in businesses doing business with other businesses. The term is commonly used in connection with e-commerce and advertising when the intended targets are businesses as opposed to consumers. **Electronic. Data.Interchange.(EDI)**, formerly reserved for proprietary solutions, can now be tied to Web interfaces via XML and Web Services, connecting back-office systems to front-end Web applications. The goal is to integrate systems and deploy solutions that can respond rapidly to changing market conditions. The combination of robust open source code, skilled personnel and affordable, transaction-based models that **Application.Service.Providers.(ASPs)** are adopting, allow companies to better serve their customers.

B2B Exchange

B2B.exchange (also called a marketplace or hub) is a website where many companies can buy from and sell to each other using a common technology platform. Many exchanges also offer additional services, such as payment or logistics services that help members complete a transaction. Exchanges may also support community activities, like distributing industry news, sponsoring online discussions and providing research on customer demand or industry forecasts for components and raw materials. Table 14.1 tabulates the difference between a Public B2B Exchange and a Private One.

There is not strict guideline for company to choose which the best to choose is and is dependent on what they want to do. If a company intend to buy and sell commodity products, public exchanges can be a good option because of the accessible information such as low prices or identify new customers. Public exchanges are also becoming a popular way for a company to unload excess inventory. In some industries, however, suppliers have been reluctant to use public exchanges because they fear buyers will aggregate their purchases and force prices too low, squeezing their profit margins. Common types of transactions on public exchanges include purchasing through requests for quotations, buying through catalogues and auctions.

Table 14.1. The difference between a public B2B Exchange and a private one

Public Exchanges	Private Exchanges
Public exchanges are owned by industry consortia or independent investors and have their own boards of directors. Though each exchange sets its own rules, they are generally open, for a fee, to any company that wants to use them.	Private exchanges are run by a single company for doing business exclusively with established suppliers and customers (although the systems that support it may be outsourced).

Companies that prefer to use private exchanges because of the ability to create closer online relationships with preferred customers and suppliers. In addition, private exchanges are more secure, because data about their trades are at less risk of being exposed to competitors if there's a security breach. Companies use private exchanges to trade proprietary information like supplier performance metrics and sales forecasts in addition to orders and invoices and also to establish central control over purchasing through contracts with established suppliers.

Collaborative B2B E-Commerce

By utilizing the B2B e-commerce, companies are not only able to share the blueprints or the latest sales forecasts; trading partners are giving each other the real-time access to the company ERP, product design, inventory and other systems. Results demonstrates that companies that are implementing it has improve significantly in introducing new products to market faster, reduce manufacturing time, keep inventory low and adjust more quickly to changes in customer demand.

However, in order to the collaboration to successfully implemented, the business and their partners need to have an up-to-date, functioning systems to serve up data sharing and deliver the information electronically. However one of the barriers to implement a successful B2B e-commerce is that a lot of the existing companies are still using the conventional communication method such as phone and fax. For example, The Goldman Industrial Group, a Boston-based manufacturer of machine tools for the automobile industry, has found it has been difficult to convince their partners to invest in system upgrades needed for collaboration due cultural resistance. The reasons for resistance include the trust, sharing confidential information and also fear that online collaboration might result in layoffs.

Business Units in a B2B Project

The most effected business unit within an organization during the B2B e-commerce implementation is the purchasing unit. B2B e-commerce can drastically change how the buyers perform their tasks, especially if the company is still using the conventional way of placing orders. Other business units that will be affected include the sales and customer service departments and inventory business unit. It is crucial to note that B2B e-commerce not only impacts the business operation internally but also on the external supply chain partners that involve suppliers, distributors and customers.

Types of Software Needed

The type of software used will be depend on various factors such as position within the business (buyer or selling), mode of purchasing (indirect or direct materials) and the extent to which the business is integrated in the supply chain. Some of elements of a B2B system may include software for generating purchase orders or requests for quotations (RFQs), processing invoices, building and managing catalogs, responding to RFQs and processing orders. Depending on the functionally of the trading objectives and specific features needed to support the operation, organization can consider features such as online negotiation capabilities, dynamic pricing software, support for international transactions and the ability to generate and process bills of materials as part of the B2B e-commerce. of the potential of B2B e-commerce can be fully utilized and reap if there exist an integration tools to connect these systems with forecasting and planning systems, inventory management, CRM, ERP, logistics and other applications use for supply chain management and customer service.

Implementation Time of B2B Systems

Depending on the complexity of the system, a simple online catalogue can be setup within few months while a more sophisticated system that require engineering to start from scratch to build a portal for suppliers that integrates with the organisation back-end systems may take more than a year. However, the most time-consuming aspect of building B2B systems is the process of mapping the business processes to those of their trading partners that may include multiple tiers within a supply chain network.

Readiness of Trading Partners

It is crucial to ensure that the setting up of B2B system will be beneficial to both the organization itself and its supply chain partners. For example, some companies have built Web portals that allow partners to place orders, input data and access information from their ERP or other back-end systems without additional investment other than Internet access. However, if the supply chain partners plan to implement their own software development to use the application, the company need to ensure that there is sufficient funding and reasonable return on investment following the initiatives.

E-PROCUREMENT

E-Procurement Defined

E-procurement is the process of business-to-business purchase and sale of supplies and services over the Internet. An important part of many B2B sites, e-procurement is also sometimes referred to by other terms, such as supplier exchange. Typically, e-procurement Web sites allow qualified and registered users to look for buyers or sellers of goods and services. Depending on the approach, buyers or sellers may specify prices or invite bids. Transactions can be initiated and completed.

Ongoing purchases may qualify customers for volume discounts or special offers. E-procurement software may make it possible to automate some buying and selling. Companies participating are expected to be able to control parts inventories more effectively, reduce purchasing agent overhead, and improve manufacturing cycles. E-procurement is expected to be integrated with the trend toward computerised supply chain management.

Embedding E-Procurement in an Organization

Organizations are facing dilemma in deciding whether to invest in e-procurement applications because they are unsure if the initiative can be benefited from electronic sourcing and purchasing. Some of the tips to assists organization on decided e-procurement decision are listed below:

1. Is the value of the spend high or low?
2. Is the product or commodity highly substitutable or not?
3. Is there a lot of competition or a little?
4. How efficient are your internal processes?

E-procurement be beneficial to organization in different aspects including lower prices, better productivity, faster processing, greater visibility, the elimination of maverick, or unplanned, ad hoc buying and the opportunity to have a much higher ROI. The bottom line on e-procurement depends on the company and what it's buying. Some companies integrate their SCM and ERP systems to support e-procurement activities (Koh et al, 2006b).

The Future of E-Procurement

Today, both the technology and the buyer's expectations have matured to the point where e-procurement can genuinely be used to source things other than catalogue-based indirect goods. To manage expectations of an e-procurement effort, it is important to remember that the ROI will come only partly through lower purchasing prices. The rest of the return will come from efficiency improvements within the buying process. And the job of moving those improvements from the theoretical to the practical often falls upon the direction of the CIO.

Leading E-Procurement System Vendors

Table 14.2 shows examples of some leading e-procurement systems vendors.

BUSINESS-TO-CONSUMER (B2C)

B2C Defined

B2C businesses aim to service transactions from business to consumers. An example would be an e-retailer such as Amazon.com. E-business solutions has served the purposed of easing consumer in buying products/services online. For example, In addition of selling books online, college students could turn to Amazon as an alternative source when bookstores ran out of texts and other materials needed quickly for classes.

One of the challenges in B2C is the issue of channel integration. During the initial stage of B2C implementation, a lot of brick-and-mortar stores refused to integrate their Web presence with internal back office systems resulting in creating a separate Web entity that resulted in "cannibalisation" of the existing channels. Survey results have shown that online shopper is different from the in-store shopper. For example, customer-focused companies such as The Gap worked quickly to adapt systems to allow customers to purchase products online and return them easily at retail outlets.

Table 14.2. Leading e-procurement systems vendors

Ariba	*www.ariba.com*
CombineNet	*www.combinenet.com*
Commerce One	*www.commerceone.com*
Elance	*www.elance.com*
Oracle	*www.oracle.com*
QAD	*www.qad.com*
SupplyWorks	*www.supplyworks.com*

This vision gave customers the options, and elevated e-commerce from a glorified mail order service to a customer value creation and retention opportunity.

Other example of a successful integration cases are online banking, online travel booking, much improved holiday retail sales support, and bill pay services. Traditionally these services were a chore and inconvenience for the customer (who had to get to the bank between 8-5, find a travel agency, and remember to mail bills on time). However, the customers now have the full control, and at the same time companies are able to reduce costs and concentrate on process improvement and service enhancement. In summary, to ensure the success of B2C implementation, companies need ensure that customer's feedback and requirements should not be ignored.

The Future of B2C Commerce

In the North American online retail market is expected to grow 45% in 2001 to $65 billion, according to a joint study conducted by the industry group Shop.org and the Boston Consulting Group. Forrester Research also predicts that B2C e-commerce in the US will grow from $38.8 billion in 2000 to $184.5 billion in 2004.

Year 2001 has seen a lot of dotcom companies gone bust. As of June, 330 dot-coms had closed their doors since the start of the year. However, at the same time, brick and mortar retailers are attracting more online visitors and profiting from multichannel strategies in which they promote their websites in stores and advertise in-store promotions on their websites. As a result, implementing B2C commerce is still feasibility however the operation needs to be integrated by a viable business plan with the support of top management.

Organization of B2C Initiatives

In the early days, e-commerce initiatives were often led by groups that were separate from the main IT department. The extreme example of this kind of separation was the spinoff model, in which stand-alone Web units were created thousands of miles from company headquarters with entirely new staffs. In these cases, IT leaders at the home office often had little to do with the B2C projects. Increasingly, e-business departments are coming back under the corporate umbrella and Chief Information Officers (CIOs) are often in charge.

Major Challenges of B2C E-Commerce

- **Getting.browsers.to.buythings:.**It is important to ensure that customers do not only browse the website but to ensure that they are buying something off the website. In order to do so, it is crucial to increase the conversion rate by including improvement such as improving navigation, simplifying checkout process (such as one-step checkout and easily replaced passwords), and sending out e-mails with special offers. The so-called conversion rate for B2C e-commerce sites is still fairly low. (Boston-based Yankee Group said in November 2000 that the average rate was 1 percent.)

- **Sustaining.and.building.customer.loyalty:.**It has been a challenging task to ensure website build is able to attract and maintain the loyalty of new and existing customer. Table 14.3 illustrates some tips for building customer loyalty in B2C context.

Channel Conflict

Channel conflict, or disintermediation, occurs when a manufacturer or service provider bypasses a reseller or salesperson and starts selling directly to the customer. Some sectors, including the PC, automobile industries and service industries such as insurance and travel, are vulnerable to such problem. Levis, for example, pulled its website after its resellers protested. And in the fall of 1999, General Motors tried to buy back 700 franchises and sell cars direct -mostly to build out a possible Internet channel. However, the plan did no success and resulted in upsetting the dealers

Table 14.3. Tips for building customer loyalty in B2C context

Tactic	Reason
Focus on personalisation	A wide array of software packages is available to help e-commerce sites create unique boutiques that target specific customers. For example, American Airlines has personalised its website so that business fliers view it as a business airline and leisure travellers see it as a vacation site. Amazon, which built its own personalisation and CRM systems, is well known for its ability to recognise customers' individual preferences.
Create an easy-to-use customer service application	Providing just an e-mail address can be frustrating to customers with questions. Live chat or, at the very least, a phone number will help.
Focus on making your site easy to use	Many potential on-line businesses are lost due to poorly structured and designed website.
Fulfilment	E-commerce has increased the focus on customer satisfaction and delivery fulfilment. One cautionary tale is Toys "R" Us' holiday debacle in 1999, when fulfilment problems caused some Christmas orders to de delivered late. Since then, companies have spent billions to improve their logistical systems in order to guarantee on-time delivery. Providing instant gratification for customers still isn't easy, but successful B2C e-commerce operations are finding that fulfilment headaches can be eased with increased focus and investment in supply chain and logistical technologies.

Exhibit 14.3.

Mini Case – China

Many enterprises have successfully used the Internet as a tool to coordinate with their suppliers or customers. By 2001 in China, 75% of chemical enterprises, 56% of telecoms enterprises and 51% of manufacturers have operating websites. Among the major State-Owned Enterprises (SOEs), there are a few leaders in e-commerce, which mostly involved in international trade and adopt e-commerce to interact with foreign customers and to respond to foreign competition. Most SOEs have not adopted e-commerce, and those that have are mostly at the pilot project stage. Although the Chinese government is encouraging SOEs to adopt IT and e-commerce as tools to cut costs and improve productivity (Dedrick and Kraemer, 2001), there are a number of inhibitions that hinder the Chinese's e-commerce growth (Zhu, 2002). These include the lack of real understanding of e-commerce; lack of infrastructure to support e-commerce; lack of low price, simple application solution; lack of trust, reliability and security issues; lack of resource to implement and maintain e-commerce; lack of legal and regulatory framework; lack of other critical elements e.g. online payment and certification; and lack of technology standards to ensure interpretability.

and prompting discussions with GM. In order to resolve such conflict, companies are solutions without upsetting their salespeople. For example, big car companies and manufacturers such as Maytag are setting up websites that allow customers to decide what they want before being redirected to a local dealer.

Leading E-Business Software Vendors

The leading e-business software vendors are listed below:

- Oracle
- SAP
- Peoplesoft
- Microsoft
- Siebel

EMERGING/FUTURE TRENDS AND CONCLUSION

It is obvious that e-technology has taken a central part of our daily life and activities. Being a mean of support or a necessity, it brings both costs and benefits to our political, social, economical, cultural, organisational and environmental systems. The new and current ICT developments have sparked many trendy and innovative ideas, products and solutions. Based on this move, it can be envisaged that the emerging and future trends of ICT will take some discrete and/or combination of the following technological forms:

- 'All in One'
- Accessibility
- Agent-based
- Biometrics
- Biotechnology
- Compact yet simple
- Compatibility across platforms
- Completely idiot proof
- Connectivity across systems and platforms
- E-things
- Flexibility
- Generalisibility across systems and users
- Hologram technology
- Lower cost
- Mobility
- Multi-purpose and multi-function
- Nanotechnology
- Networked
- Over the web
- Recyclable
- Robo-sapien (robot and homosapien) technology
- Super speed
- Transferability across systems
- User friendly
- Virtual environment
- Wireless
- Clean technology
- Sustainable, environmental and green solutions

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Chapter XV
Knowledge Management

It is impossible to observe certain inter-related roles associated with knowledge, information is acted upon through these roles to become knowledge…these roles can be broadly classified as Acquisition, Utilisation, Adaptation, Distribution and Generation. (Koh et al, 2005)

Knowledge Management (KM) Defined

Knowledge Management can be defined as the critical issues of organisational adaptation, survival and competence against discontinuous environmental change. Essentially it embodies organisational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings. This definition proposed by Dr Yogesh Malhotra summarises a key issue for e-learning strategies and the way they will impact professional training and companies' organisation policies.

Knowledge management (KM) initiatives, projects and systems are just beginning to appear in organizations, there is little research and field data to guide the successful development and implementation of such systems or to guide the expectations of the potential benefits of such systems (Alsadhan et al, 2008). Knowledge management concerns with capturing, organising, and storing knowledge and experiences of individual workers and groups within an organisation and making it available to others in the organisation (Nonaka, 1998).

The information is stored in a special database called a knowledge base and is used to enhance organisational performance. Two of the most common ways are: Documenting individual's knowledge and disseminating through manuals or a database. Using such tools as groupware, email, and the internet could also facilitate communication (Koh & Maguire, 2004).

The concept of Knowledge Management (KM) has been around for a while; management gurus and academicians in the last two decades have researched KM as a tool for achieving innovation and competitiveness. In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge (Nonaka, 1998). KM and research initiatives have been implemented in a wide range of industry sectors like manufacturing, consulting, software, banking, insurance, call centre, etc. across the globe.

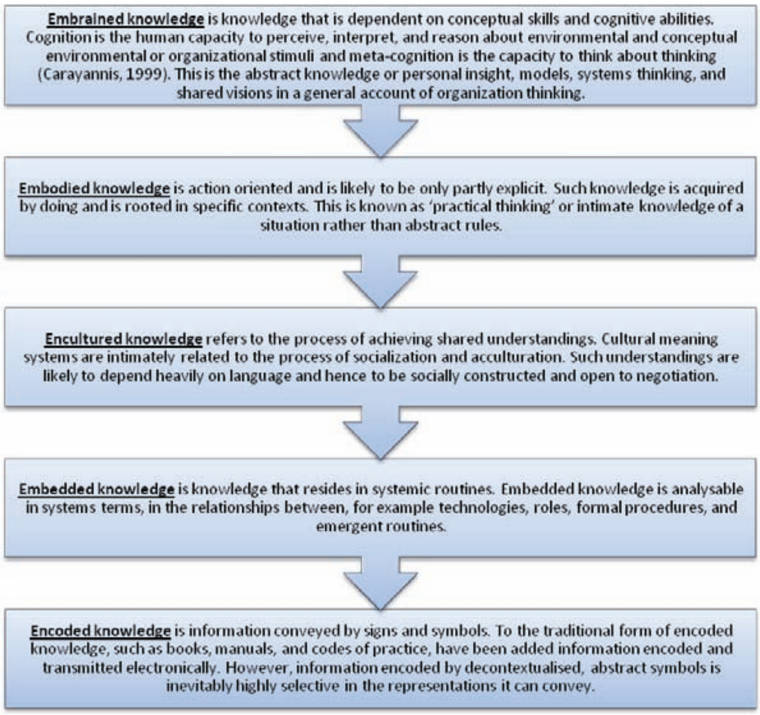
Knowledge Classification

Not all information is valuable. Therefore, it is up to individual companies to determine what information qualifies as intellectual and knowledge-based assets.

Explicit and tacit knowledge are the most widely accepted and elaborated knowledge classification (Nonaka, 1994). **Explicit.knowledge** is precisely and formally articulated and codified in documents and databases of corporate procedures and best practices (Alter, 2002). For example, patents, trademarks, business plans, marketing research and customer lists. An example of application of converting tacit into explicit knowledge can be found in Koh & Gunasekaran (2006)'s work on a new approach to manage uncertainty.

Tacit.knowledge is the practical wisdom possessed by experts that is difficult to capture, yet repeatedly demonstrated in contexts as varied as factory floors, research laboratories, army basis, and corporate board rooms (Crowley, 2000). The challenge inherent with tacit knowledge is figuring out how to recognise, generate, share and manage it. While IT in the form of e-mail, groupware, instant messaging and related technologies can help facilitate the dissemination of tacit knowledge; identifying tacit knowledge in the first place is a major hurdle for most organisations. A method to capture tacit knowledge can be found in Koh et al (2005). Another major distinction of knowledge is cultural knowledge (Blackler, 1995; Snowden, 2000; Choo, 2002). Cultural knowledge is defined as the assumptions, beliefs, and values of people (Choo, 1998).

Figure 15.1. Classification of knowledge



However, many other classifications have also emerged, but they are all an extension of these basic classifications. A better understanding is possible by looking at Blackler's (1995) study in which he identifies five classifications of knowledge, which are embrained, embodied, encultured, embedded and encoded as shown in Figure 15.1

Benefits of KM

Some benefits of KM correlate directly to bottom-line savings, while others are more difficult to quantify. In today's information-driven economy, companies uncover the most opportunities — and ultimately derive the most value — from intellectual rather than physical assets. To get the most value from a company's intellectual assets, KM practitioners maintain that knowledge must be shared and serve as the foundation for collaboration (Carayannis, 1999). Yet better collaboration is not an end in itself; without an overarching business context, KM is meaningless at best and harmful at worst. Consequently, an effective KM program should help a company do one or more of the following:

- Foster innovation by encouraging the free flow of ideas
- Improve customer service by streamlining response time
- Boost revenues by getting products and services to market faster
- Enhance employee retention rates by recognizing the value of employees' knowledge and rewarding them for it
- Streamline operations and reduce costs by eliminating redundant or unnecessary processes

The most difficulty challenge in implementing KM in an enterprise is not about the technology or architecture; it is about convincing human element/knowledge owner to participate in this project of change.

Knowledge Management Models

Many models of knowledge management can be found in the KM literature, the most widely quoted among them are the ones developed by KM gurus including Wiig (1993), Nonaka (1994), Edvinsson & Sullivan (1996), Carayannis (1999) and Despres and Chauvel (2000).

Wigg's knowledge management framework rests on three pillars, which represent the major functions needed to manage knowledge. In practice, each of these functions consists of formal methodologies and informal approaches. The three pillars are: explore knowledge and its adequacy; assess value of knowledge; and manage knowledge activity. This model has captured some of the useful issues that are theoretical and practical in the KM area. The steps associated in this model do not explain the purpose of each step. For example, the model says 'handle, use and control knowledge', it does not say why or how to control this knowledge. How do we handle or control tacit or cultural knowledge? This model also lacks an implementation framework or strategy. Also, the model is generic in nature without considering the differences in industry, organisational structure, culture, etc.

Nonaka's SECI model is the most widely discussed theories in KM literature. The model was constructed from empirical evidence gathered in case studies of Japanese firms (Honda, Canon, Matsushita, NEC, Sharp and Kao) and aimed to elaborate a new theory of KM. At the core of the model is the distinction between tacit and explicit knowledge, and the dynamics of the analysis of knowledge creation through cycles of Socialization, Externalisation, Combination, and Internalisation (SECI) cycles based on the assumption that knowledge is created through conversion between tacit and explicit knowledge. From this assumption, Nonaka proposed four different modes of **knowledge.conversion**: (1) from tacit knowledge to tacit knowledge, (2) from explicit knowledge to explicit knowledge, (3) from tacit knowledge to explicit knowledge and (4) from explicit knowledge to tacit knowledge. Nonaka explained that the 1st is the result of socialization, 2nd is the result of combination, 3rd is the result of externalization and 4th is the result of internalization.

The work of Nonaka is helpful in providing insight into a wide range of issues related to knowledge creation process and a number of specific mechanisms used to manage knowledge to facilitate that process. Nonaka has described in detail a number of mechanisms to facilitate the sharing of knowledge and the process of learning at organisational level. Nonaka has clearly shown the relationship between the mode of knowledge conversion and their contribution to the conversion of individual into organizational knowledge. Nonaka has presented in a simple manner the various dynamics of knowledge creation, distribution and management. Nonaka's theory formed a basis for later improvements and continued studies.

However, some issues remain unclear. For Nonaka's work, the source of codified knowledge does not matter or has no relevance. It seems that it does not matter if the effort to acquire tacit knowledge from external source or internal source is different (Dutrenit, 2000). Firms do not seem to need external sources of knowledge, however it has been stressed in many later studies that external sources (customers, market surveys, etc) of knowledge is an essential element for firms in knowledge management (Davenport & Prusak, 1998). Nonaka used a narrow definition of tacit knowledge and several degrees of codification of tacit knowledge, again it has been established by several researchers that conversion of tacit knowledge to explicit knowledge is possible to only a limited extent (Tsoukas & Vladimirou, 2001). Nonaka's SECI model is a generic model that needs to be modified to fit into various industries, sizes and cultures to be able to put into practice.

Using **innovation.management.**theory, Edvinsson and Sullivan developed the Intellectual Capital Model (ICM) of a firm. This model suggests that the intellectual capital of a firm has four major elements, namely human capital, structural capital, complementary business assets, and intellectual property. The ICM model is designed to facilitate innovation in organizations to achieve competitive advantage. Its main character is to innovate and codify the knowledge, and to reuse for removing competitors' threat. The ICM model is mainly concerned with the management of resources for achieving innovation, and commercialisation of innovation for monetary benefits. They have successfully identified and classified the resources into categories that lead to commercialisable innovations and those resources that helps improve service that add value to innovations. However, the ICM model has failed to accomplish the classification of knowledge in an organisation and to identify the way to manage the resources for knowledge management. Looking at this model, we know what these resources can contribute, but we do not know how to make these resources contribute. The ICM model may be useful for industrial concerns, but its suitability for a call centre looks out of scope.

Carayannis has contributed the Organizational Cognition Spiral (OCS) and Organizational Knowledge Network (OK Net) models to the KM literature. The OCS model defines different knowledge states that are a function of two dimensions – Knowledge (K) and Meta-Knowledge (MK) and it consists of successive 'knowledge cycles' where an individual or organization can transit and traverse four stages of awareness or ignorance. The OK Net model is an experimental test bed or technology platform for designing and testing an organizational knowledge management network for the support, monitoring, capturing, measurement, and enrichment of organizational cognition in an eight stage process. Table 15.1 shows the details of the eight-stage process of knowledge management (Carayannis, 1999).

The OCS model is strongly rooted in cognitional learning theory, which the levels of learning certainly exhibits the true nature of learning process in the organization. Once the current stage of awareness of the organisation has been mapped, it is possible to traverse the various stages to reach the desired stage. However, a key requirement is a database of interest/expertise profile on the human capital of the firm (knowledge/expertise maps/repositories) that supports the OK Net model. It is not made clear how this is to be created; codification of explicit knowledge itself is a difficult process, leave alone tacit or cultural knowledge. Another issue is determining the current knowledge level of the firm to map it to a stage. This exercise needs expertise and the process is time consuming. No guidelines are provided as to how this can be achieved. The whole model once implemented may provide the

Table 15.1. Carayannis's eight-stage process of knowledge management

Stages	Steps	Descriptions
Stage 1	Identify	Determine Core competencies, sourcing strategy, and knowledge domain.
Stage 2	Capture	Formalize existing knowledge.
Stage 3	Select	Assess knowledge relevance, value, and accuracy. Resolve conflicting knowledge.
Stage 4	Store	Represent corporate memory in knowledge repository with various knowledge schemata.
Stage 5	Share	Distribute knowledge automatically to users based on interest and work. Collaborate on knowledge work through virtual teams.
Stage 6	Apply	Retrieve and use knowledge in making decisions, solving problems, automating or supporting work, job aids, and training.
Stage 7	Create	Discover new knowledge through research, experimenting and creative thinking
Stage 8	Sell	Develop and market new knowledge based products and services.

firm with knowledge management capabilities but the initial implementation looks like a complex matter.

Despres and Chauvel developed a meta-model that is based on four dimensions of knowledge management, namely time, type, level and context. Based on the time dimension, an event chain from a linear and structural perspective can be specified. While this representation greatly simplifies the interconnected and multiple-causal nature of cognition, it appears to fit many of the issues addressed in this field. The most prominent distinction with regard to types of knowledge is that of tacit and explicit. Yet, there is clearly little acknowledgement in the field that knowledge is multiplex rather than singular. They suggested three levels of social aggregation to knowledge: individuals, groups and organizations. They also found that a deeper importance lies in the seldom realised reality that nothing has any meaning outside of a context.

This meta-model describes in depth the various dimensions of knowledge and captures the various discourses that exist in knowledge management. It is possible to gain a good understanding of knowledge and the thoeretical basis of knowledge management. The model also successfully covers all that is relevant in literature of KM. They have managed to construct a theoretical framework which is basically based on the findings of other researchers, but has been very successful in placing each concept appropriately in connection with others and is completely meaningful. However, such theoretical basis was not followed up with an implementation model or implementation plan. This makes the meta-model good only for gaining a clear understanding of knowledge concepts and related management issues but renders the model less useful from an implementation point. The meta-model also ignores issues of industrial differences and culture.

The Challanges of KM

Getting Employees on Board

In an environment where an individual's knowledge is valued and rewarded, establishing a culture that recognizes tacit knowledge and encourages employees to share it is critical. The need to sell the KM concept to employees shouldn't be underestimated; after all, in many cases employees are being asked to surrender their knowledge and experience—the very traits that make them valuable as individuals.

One way of companies to motivate employees to participate in KM is by creating an incentive program. However, there is a risk that employees will participate solely to earn incentives, without regard to the quality or relevance of the information they contribute. The best KM efforts are as transparent to employees' workflow as possible. Ideally, participation in KM should be its own reward. If KM doesn't make life easier for employees, it will fail.

Allowing Technology to Dictate KM

KM is not a technology-based concept. Companies that implement a centralized database system, electronic message board, Web portal or any other collaborative tool in the hope that they've established a KM program are wasting both their time and money.

While technology can support KM, it's not the starting point of a KM program. Make KM decisions based on who (people), what (knowledge) and why (business objectives). Save the how (technology) for last.

Not Having a Specific Business Goal

A KM program should not be separated from a business goal. While sharing the best practices is a commendable idea, there must be an underlying business reason to do so. Without a solid business case, KM is a futile exercise.

KM Is Not Static

As with many physical assets, the value of knowledge can erode over time. Since knowledge can get stale fast, the content in a KM program should be constantly updated, amended and deleted. What's more, the relevance of knowledge at any given time changes, as do the skills of employees. Therefore, there is no endpoint to a KM program. Like product development, marketing and R&D, KM is a constantly evolving business practice.

Not All Information Is Knowledge

Companies diligently need to be on the lookout for information overload. Quantity rarely equals quality, and KM is no exception. Indeed, the point of a KM program is to identify and disseminate knowledge gems from a sea of information.

WHO SHOULD LEAD KM EFFORTS IN AN ORGANIZATION?

Since KM is not a technology-based concept but a business practice, enterprise wide KM efforts should not be lead by the CIO. (The CIO is a suitable choice to lead KM efforts within the IT department, however.) Some companies have dedicated KM staff headed by a chief knowledge officer or other high-profile executive.

Other companies rely on an executive sponsor in the functional area where KM is implemented.

Technologies to Support KM

KM tools run the gamut from standard, off-the-shelf e-mail packages to sophisticated collaboration tools designed specifically to support community building and identity. Generally, tools fall into one or more of the following categories: knowledge repositories, expertise access tools, e-learning applications, discussion and chat technologies, synchronous interaction tools, and search and data mining tools.

10 PRINCIPLES OF KM BY THOMAS DAVENPORT

- Knowledge management is expensive (but so is stupidity!)
- Effective management of knowledge requires hybrid solutions of people & technology
- Knowledge management is highly political
- Knowledge management requires knowledge managers
- Knowledge management benefits more from maps than models, more from markets than from hierarchies
- Sharing & using knowledge are often unnatural acts
- Knowledge management means improving knowledge work processes
- Knowledge access is only the beginning
- Knowledge management never ends
- Knowledge management requires a knowledge contract

Leading KM Software Vendors

Table 15.2 shows some examples of leading KM software vendors.

FUTURE TRENDS AND CONCLUSION

In a traditional business setting, KM normally would not be considered in any major decision making. In today's knowledge-based new business setting, knowledge is power. Hence, rapid increases of number of organisations are adopting some sort of KM methods to capture the knowledge flow and lock the intellectual knowledge

Table 15.2 Examples of leading KM software vendors

80-20.Software	**OneSource**
BroadVision	**Open.Text.Corp.**
Cognos	**Oracle**
ePeople	**PeopleSoft**
Exact.Software	**Percussion.Software**
Information.Builders	**SAP**
Intelliseek	**SAS**
Microsoft	**Selectica**

capital. This applies both in manufacturing and service sectors. More advanced technology, e.g. mobile phone, PDA and so on are adopted to monitor and capture data flow, hence providing a basis to turn the information analysed into useable knowledge in the future.

Owing to increased fluidity of resources and people in organisations, there is no guarantee that an employee will work in the same organisation for life. The hard reality and impact this phenomenon has made on an organisation is the lost of key knowledge that has been built up by the employees. A more sophisticated way of managing the intellectual knowledge capital in today's dynamic workforce and organisational environments are necessary. Little holistic model or framework exist for managing the entire knowledge logistics in organizations and supply chains.

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Chapter XVI
Security and Risk Management

The value of information and knowledge is directly proportional to the risk of losing it. (Koh, 2007)

Security and Risk Management Defined

In information terms, **security** can be defined as the processes of ensuring that private information remains private and uncompromised in an atmosphere where all other information is free. Security techniques such as encryption, passwords, and firewalls are designed to prevent unauthorized access to information, to protect the integrity of computing resources, and to limit the potential damage that can be caused by attackers and intruders. The notion of a "secure computer" is relative though: the only truly secure computer is one powered down in a locked facility that no one has access to.

Risk management is the ongoing process of assessing the risk to automated information resources. It is part of a risk-based approach used to determine adequate security for a system by analysing the threats and vulnerabilities and selecting appropriate cost-effective controls to achieve and maintain an acceptable level of risk (Maguire, 2002).

Exhibit 16.1.

Mini.case:.Loosing.government.data.–.Risking.the.nation.

A computer hard drive containing the details of about 5000 employees of the justice system was reported missing on 7 September 2008. The justice secretary was not informed about this lost, which happened in July 2007. It was reported that the details of employees of the National Offender Management Service in England and Wales, including prison staff, were lost by private computing firm EDS. The Justice Minister was very angry at the loss and various enquiries are conducted to establish the cause of this loss.

There are various recent losses of government data in the last two years, including (1) Nov 2007: 25m people's child benefit details, held on two discs; (2)Dec 2007: 7,685 Northern Ireland drivers' details; (3) Dec 2007: 3m learner drivers' details lost in US; (4) Jan 2008: 600,000 people's details lost on Navy officer's stolen laptop: (5) June 2008: Six laptops holding 20,000 patients' details stolen from hospital; (6) July 2008: Ministry of Defence (MoD) reveals 658 laptops stolen in four years.

It is clear that the impact of the loss of government data will impose major risks to the society at all levels, raising concern on data, personal and business securities. For example, for the case on 7 September 2008, the use of a private firm in handling the data has certainly resulted in unwanted exposure. A review of the existing policy and data security procedure in handling government and sensitive data must be carried out and new, more restricted and enforced procedure must be in place in order to minimise future major risks.

Source: BBC News, Data on 5,000 justice staff lost, 7 September 2008, UK.

Prediction and Impact

According to the Pew Internet & American Life Project and Elon University in January 2005, two-thirds of security experts believe that the US will suffer a 'devastating' cyber attack within 10 years. The attack may hit critical infrastructure or large industries, like banking. To add another level of vulnerability into this risk, Cyota in January 2005 noted that almost half (44 percent) of online banking customers use the same password for multiple online services. Furthermore, 37 percent of online banking customers use the same password at other, less secure sites.

International Data Corporation predicted in December 2004 that revenues for antispyware software companies are expected to climb from USD12 million in 2003 to USD305 million in 2008. It is clear that with the increased adoption and utilisation of e-technology in our lives, the greater the risks it imposes on us.

POTENTIAL SOLUTIONS TO IMPROVE SECURITY AND REDUCE RISK IN E-BUSINESS

A Documented Security Policy

According to security experts, it is important that every company should demand to see its B2B partners' written security policy. For example, Lee Holcomb, CIO of NASA in Washington, D.C., says that it is something he is strict about this because he uses online connections to post competition opportunities and pay aerospace vendors and contractors. He expects policies to include firewall maintenance and patch-service provisions and to provide for vulnerability assessment and intrusion detection, as well as a training program for systems administrators who would have access to sensitive information. "We're dealing with astronauts or pilots in space,"

The Federal Reserve typically asks for a written description of a partner's security organization, including its rules and responsibilities and where the security function reports. If security is buried in the technical bowels of an organization, it is probably will not have a significant influence on senior management. "The policy should also be able to identify individuals managing the partner's security program", said Harry DeMaio, a director in Deloitte & Touche's enterprise risk practice in New York City.

Secure Application Development Practices

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In most B2B relationships, supply chain partners have granted limited authority to access into each other's systems and access critical information. If your partner is using proprietary applications that touch your system, security must be built into that application. Your partner must show you how security is incorporated into its application design, development and deployment plans. It is essential to look for access and authorization controls built into applications, path isolation to ensure that the application user goes only where he is allowed to go, and logging and reconciliation to provide a record of where any user has been—matching up with what he/she has done. Make sure the application does not turn off or ignore other security controls, such as encryption, associated with the B2B system.

Access Control and User Authentication

Relaxing access controls within your partner's systems will increase risk of losing intelligence as a result of unauthorised access. It was reported that Ray Bedard, a partner in PricewaterhouseCoopers' supply chain practice in Virginia Beach, Va., tells of a company he worked with that failed to terminate a departing employee's access to its B2B applications. Before the employee left, he went into the system and ordered a bunch of goods from an online partner. The goods arrived and nobody could figure out what they were doing there. It took several hundred man-hours for the parties to resolve the 'surprises'. This is a minor case which shows loss of man hours in tracking the source of the problem. Imagine if these are intelligence of secret services or other forms of highly sensitive information, the impact will be very significant and may result in global political, economical, social and environmental impact and security.

For sensitive information, companies should require higher-level access and authorization tools. Biometrics technologies including iris scan, voice recognition, finger print and other similar unique identification methods built as multiple layers of security access will help reducing the risks of unwanted cyber and network crime.

For less sensitive transactions, such as purchase orders, auctions and item tracking, strong password and user-name controls suffice. Companies should require partners to maintain strong, active password programs. Measures should include requirements to change passwords frequently, monitoring and logging of password usage, tools to detect easily guessed passwords and a central authority to set access policies.

Encryption

Experts and practitioners say companies should require their partners to use **encryption** for any sensitive Information — customer data, marketing strategy, labour relations and unreleased financials—transmitted over the Internet. The Federal Reserve is constantly dealing with financial information, so anything transmitted between the Federal Reserves and its financial and banking partners have to be properly secured. The same policy is applicable to the Bank of England.

Particularly for on-line banking, e-business and other e-government services, it is essential that the data of users are encrypted.

Response Plans

A clear **response.plan** is necessary in order to manage expected resistance from partners in the request for increasing level of security for information transaction. Similarly, the response plan should also entail activities to be undertaken in the event of detected security bridging, fraud and other network related crime. Clear responsibility of partners in the supply chain must be set up in order to deal with such event. For example, a detected fraudulent use of credit card would automatically trigger police, bank and associated agency/organization and owner's alert immediately, which would lead to subsequent validation process and appropriate actions.

Segmented Architectures

Some security analysts advocate**. "segmenting". enterprise. architectures** into smaller networks, all behind separate firewalls. That way, if one part of the network is compromised, the rest remains safe.

This segmentation is crucial in order to provide maximum protection to higher secured information. Such prioritization will be the underpinning context for setting up appropriate authorization to various segments of the information architecture.

Background Checks

If it is a standard practice in an organization to conduct background checks on employees with access to sensitive data, it is reasonable to request the same for partners' employees who also have access. This is likely a practice in businesses where such background of an individual/partner will deter or prevent future work or access to certain information or individual. For example, in the banking industry, it is a common practice that a background check is necessary for bankers. Such practice is a measure to detect any conflict of interests at an early stage and prevent major problems in the future.

Social security database, police database and so on will be the sources for information for carrying out the background check.

It must be noted that it is not easy to get partners in the supply chain to exercise similar practice, and for IT managers to appreciate the risks involved in the relationship being established. Despite such difficulty, it is a good practice that background checks are performed in order to prevent unwanted problems in the future.

Compliance Audits

Experts and practitioners agree the best way to validate **compliance** is through periodic audits, either by your own auditors or an independent third-party security company, as Visa requires. Typically the party requesting the audit will pay the bill.

The most security-conscious organizations require their partners to submit to penetration testing on a regular or random basis. This tests the security and robustness of the system, and provides a basis to decide whether an increased level of security of required.

Periodic.audit.and.review of systems security is important in order to keep up to date with the robustness of the technology to the recent change of technology environments.

Taking no chances, some companies turn to isolated networks and batch processing to protect themselves from their B2B partners (Maguire, 2004).

Data Security in the National Health Service

When new systems are introduced into organisations it is very important that they are linked to some form of **risk.assessment**. Data security should be a number one priority for firms as there are increasing opportunities for information systems to be breached either internally or externally. In most cases this can lead to financial problems for organisations. This could be a direct financial penalty for the company or the fact that customers lose confidence in the firm's ability to store, maintain, and secure sensitive data.

It is imperative that data security is given top priority in the health sector where errors can lead to the health of patients been put at risk. Since 2005, when the National Programme for Information Technology (NPfIT) began keeping records, National Health Service (NHS) trusts have reported 290 incidents which put patients' safety at risk.

It has emerged that government ministers launched the NpfIT in 2002 without a formal structure for identifying incidents that could affect patient safety. A significant number of the incidents reported under the safety scheme focus on radiology information systems and picture archiving and communication systems (Pacs), which store and distribute digital x-ray images. One incident involved two NHS trusts that interfaced with the same Pacs. Both used similar identification (ID) numbers to store and retrieve the images, but some numbers were duplicated so in certain situations a correct number would access another patient's x-ray image.

There have also been incidents of drugs "mis-mapping" whereby the wrong drugs are given to patients or in some situations it could lead to a clash of medication. It is obviously difficult to make a direct link between a failure in the systems and a patient's health been put at risk. Last year the partner of a patient who died in hospital complained to the General Medical Council that x-rays on a Pacs may have been mixed up (Computer Weekly 2008).

FUTURE TRENDS AND CONCLUSION

With increased traffic of on-line business transactions, whether this is a B2B or a B2C, it is a huge responsibility for any service providers to maximise security and minimise risk. The impact of information loss and delay are directly related to bottom line of any businesses. Although much investment has been put on increasing ICT and network security, it is impossible to guarantee a 100% security. Therefore, it is advisable that managers should be continuously alerted with any updates and multiple contingency mechanisms are in place.

Owing to the booming market of 3rd information storage providers, information security and risks will become a topic that will not be rest in peace. The future trends on this would be to increasingly link such risk to the business insurance/contract. However, this will then call for a more formal regulatory framework to justify the responsibility for information security and impact of risk.

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Selected Readings

Chapter XVII
Improving IT-Enabled Sense and Respond Capabilities:
An Application of Business Activity Monitoring at Southern International Airlines

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Executive Summary

Commercial airlines face an extremely challenging operating and competitive environment. To remain in business they must comply with ever-changing regulatory requirements while, at the same time, minimizing their operational costs without sacrificing customer expectations of service levels. Increasingly, airlines are realizing that a "plan-execute" mode of operation must give way to a "sense-respond" mode of operation; in other words they must become a real-time (agile) organization, capable of sensing the occurrence of unforeseen events such as the placement of a last-minute shipping order, flight delays, and cancellations, and respond effectively in real-time to such events. To enable enterprises in general, and the airline industry in particular, to improve their sense-and-respond capabilities and ensure better resource utilization, a number of software vendors are offering event stream

processing and Business Activity Monitoring (BAM) solutions. This case examines a longitudinal set of real-world implementation projects using such a solution at a major US airline (referred to as Southern International Airlines) and the results and lessons gained from this deployment.

ORGANIZATIONAL BACKGROUND

This case involves the interactions between two organizations—a solutions provider (Quantive, LLC) and a client for Quantive's products and services: Southern International Airlines (not their real name).

Quantive, LLC (www.quantive.com) is a small product and services company, founded in 2000 by Dwight Jones, and based in Alpharetta, Georgia. It employs several people as well as having contractual relationships with additional personnel when needed to staff projects for clients. As its Web site indicates, it uses a combination of software tools and services to: capture critical business events in real-time without touching existing application systems, and translates these events into actionable business information (called "BAM-alerts"). It does this without the need to engage IT staff at the client organization, save to make a one-time network connection to a router on the client organization's network. To do this, it uses a stack of software to capture transactional packets of data moving over the network (Packeterm), translating these captured packets into logical transactional events (Inquisitor), and then examining these resulting events to identify exception or alert situations, and sending messages to a manager or an application to take action regarding the BAM-alert (Medusa). Finally, Quantive Factory provides additional ways to evaluate and present event alert information from Medusa. For a more complete picture of their offering, see Appendix A.

Southern International Airlines (SIA) provides both domestic and international air travel and shipping from its primary base in the Southwest as well as other hubs located throughout the world. It was founded through an incorporation of several airline companies in 1930. It operates approximately 1,000 aircraft that fly ca. 420 million seat-miles per day with 3,900 flights per day to 250+ locations. Although SIA is better known for its passenger service, its cargo division flies roughly 5 million pounds of cargo each day, with services to 250 cities in 40 countries, providing one of most extensive cargo networks in the airline industry.

SETTING THE STAGE

Initial problem

Southern International Airlines' original motivation to adopt a (Quantive) BAM solution was to improve compliance with federal regulations issued by the US Federal Aviation Administration (FAA) and thereby reduce (or avoid) the high cost of non-compliance. In the context of this implementation project, the relevant regulation is FAA AC 43.13-1B: *Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair*, which came into force on September 8, 1998 (FAA, 2002). More specifically, chapter 10 of this regulation sets requirements for both the calculation of take-off parameters for commercial aircrafts and the disclosure of corresponding compliance figures.

The primary reason for issuing this regulation is to improve flight safety. It is to ensure that if a significant weight variation takes place after the initial flight parameters are loaded that new parameters are re-loaded. If no action is taken to recalculate these parameters, the aircraft is likely to take-off with inadequate stabilizer settings and thus decrease flight safety. In this scenario, depending on the significance of the shift in the center of gravity resulting from the non-computed weight variations, these changes could cause the aircraft to exhibit dangerous flight characteristics (FAA, 1999). To prevent this scenario from happening, Southern International Airlines must have a proper weight and balance control system to enable the cockpit crew to know the actual values of the take-off parameters in order to set the stabilizer trim properly, prior to take-off. This involves monitoring factors influencing the weight and balance condition of an aircraft, such as total weight and position of load as well as the amount and distribution of fuel. Typically, significant weight variations can result from the loading of heavy freight, an exceptionally high fuel use during ground operations due to, say, airport congestion and/or flight cancellations causing many new last-minute passengers on the flight. Under such circumstances, the take-off configuration of the aircraft must be recalculated, taking into account the new weight and balance condition.

In addition, this particular FAA regulation emphasizes the need to improve accuracy on the disclosure of information when non-compliance occurs. Non-compliance conditions are those situations where this FAA regulation is violated and an aircraft takes off with inappropriate trim settings. To gather data about this type of non-compliance, the FAA relies on data submitted by SIA on a self-disclosure basis. On the face of it, the FAA is only able to enforce compliance by auditing the control systems of SIA in order to assess their capabilities of complying with the regulation and reporting requirements.

Beyond risks for flight safety, repeated violations of the noted FAA regulation can lead to large fines, loss of reputation, and SIA managers can be held legally liable for any resulting consequences of inappropriate weight and balance settings. Compliance with this and other FAA regulations became a primary concern and SIA must be able to demonstrate to the FAA, via audits, that their weight and balance control systems are capable of:

- Detecting significant shifts in the center of gravity of aircrafts as they occur and warning those responsible for the calculation of the take-off configurations
- Recording weight and balance non-compliance cases for FAA disclosure purposes

Assessing the Business Needs

Despite the fact that the AC 43.13-1B regulation of the FAA has been in place for some time, compliance with the mentioned requirements remained an issue for SIA. Although the information about the weight and balance condition of any given SIA aircraft could, in principle, be evaluated across several transactions generated by SIA for all its flights, detecting significant weight variations in time to take compensating action (i.e., real-time) was not feasible for several reasons. First, the application systems creating these transactions did not converse with one another. And second, the detection of an out-of-balance condition was not programmed into the current systems and the reporting of the underlying transactions could not be done in real-time.

Typically, the full content of the transactions relevant to detecting an out-of-balance condition are written directly to a "flight log". Because SIA operates approximately 3,900 flights per day, the resulting flight log is very large. To gather data about a certain flight, the personnel of SIA must search through the time-ordered sequence of messages associated with a particular flight and print out several of its sections to analyze the situation for any particular flight. This was a labor-intensive and time-consuming process that could only be justified in the most serious cases. And, in its current, manual state, the analysis process could take from hours to days and thus could only be used for off-line, retrospective analyses where situations had to be reconstructed.

The end result was that, even though the basic information on different aspects of aircraft weight distribution and changes were available in the flight log, SIA did not have the capability for detecting significant weight variations in real-time, as required by the FAA, and SIA's managers knew they were unable to respond to these variations and avoid penalties or worse.

Technical Constraints to Implementing a Solution

There were important technical constraints to be taken into account when implementing a solution for the preceding FAA compliance problem. These constraints stem from the dependence of Southern International Airlines on their transactional systems and the need to keep them running and available 24x7. The characteristics of the transactional systems of Southern International Airlines will be briefly explained below.

Most load and balance procedures are carried out by the flight operations system. This is a legacy system that has been used by SIA for nearly 40 years. Though this old system is stable and reliable, it is not easily modified, nor is it capable of providing real-time visibility into take-off parameters. The system was originally designed to carry out transactions rapidly and reliably, rather than to provide adequate control mechanisms to monitor specific transaction information. Despite the fact that the transactions processed by this system contain all the information involving the weight and balance condition of aircrafts, it was not possible to directly access this information during the execution interval of the relevant transactions; only well after the fact via the resulting flight log.

Modifying the flight operations system to directly satisfy regulatory requirements was viewed as infeasible because it would involve a long project with a high degree of implementation risk and, due to the dependency of SIA on this system, any potential risk of adversely affecting the existing flight operations system was deemed unacceptable. While there are plans to replace the old system with a new system that will be fully operational in a few years, SIA remains dependent on the current system for the immediate future.

To conclude, the time and accessibility gap between information available from the existing flight operations system and that needed to assure load balancing requirements in real-time, cannot be remedied by patching the existing flight operations system due to the SIA's high dependency on this system, it's age, and the risk to ongoing operations inherent in making any change to the system. Instead, SIA had to look for a different way to solve the problem that did not in any way impact the existing flight operations system. This led them to explore the use of an event capture and reporting system (Business Activity Monitoring or "BAM") and to Quantive as a prospective solution provider.

Understanding Business Activity Monitoring (BAM)

BAM is a relatively new way of conceptualizing and solving business-related problems, Chandy and McGoveran (2004) describe BAM solutions as real-time control systems that capture events in real-time from multiple, heterogeneous sources and selectively raise alerts within time-limited windows of opportunity. These quick (low latency) alerts are aimed at providing their recipients (often operational managers) with sufficient operational insights to enable effective response to critical events (DeFee & Harmon, 2004). As such, BAM solutions are particularly well suited to managers who need to respond to exceptional combinations of events, in real time. This approach can be distinguished from seemingly similar approaches such as real-time data warehousing in that the source of the information is the accumulated events themselves (event log) rather than an ETL (extract-transfer-load) from a transaction processing system's database into a specifically designed data warehouse (Golfarelli et al., 2004).

Another important aspect of a BAM approach is that it does not affect the performance of the underlying transactional systems. Rather, BAM solutions provide a transparent platform in which events are detected by separately examining individual, pre-existing transactions and defining patterns of events over an event stream that, should they occur, warrant managerial intervention. To support the development of event-driven applications, BAM solutions are likely to include event-modelling functions that define and validate event patterns (Gassman, 2004). This makes BAM solutions highly adaptable, as new event-driven applications can be rapidly developed to address new or changing business problems.

To represent BAM solutions, Gartner, Inc. proposed a BAM model in 2002 that distinguishes three basic layers: the "Event Absorption Layer," the "Event Processing and Filtering Layer," and the "Event Delivery and Display Layer." In this model, the border of a BAM solution is the "Event Delivery and Display Layer", which is the interface of the BAM solution with the recipients of BAM alerts (Govekar et al., 2002). A simple representation of the basic three-tiered BAM model can be found in Figure 1. A more sophisticated model can be found in Schiefer and McGregor (2004).

The Event Absorption Layer detects and acquires events that arrive from multiple and heterogeneous data sources (Gassman, 2004). The source of event messages will most often be business or process-related. However, technical events, such as the occurrence of technical failures during the execution of business processes might also be collected (Gassman, 2004). These sources can include both internal sources, such as (legacy) transaction processing systems, ERP systems, and RFID applications, as well as external sources such as those made available via the Internet (e.g., weather events), thus enabling a broader and richer view of business operations and its environment (McCoy et al., 2001).

These "raw" events, regardless of source, are first fed into the Event Absorption Layer. The Event Absorption Layer is most easily achieved by tapping into the stream of transaction events moving across a network via a middleware layer (i.e., data message transport layer) that carries transactional data messages across a network from transaction origination to the transaction application systems that process and store them. As these transactions move across the network, they can be defined, captured, and collected as events of potential interest and kept in an of event log, without disrupting their normal flow and usage.

At the next stage, Event Processing and Filtering software correlates this independent event stream data (McCoy, 2004). This layer sifts through and inter-relates the captured events, looking for combinations of events that occur, or should occur and does not, that in turn warrant managerial attention and intervention. More specifically, a set of event-based business rules are pre-defined and used by this layer to identify situations that are exceptions and create the conditions for an alert.

In the final layer (Event Delivery and Display) alerts created by the preceding layer are sent to those parties who are able to understand the nature of the exception and, as appropriate, take the necessary action to circumvent or avoid an emerging problem that is identified by the event rules. The alerts can populate a display and/or trigger an action (Gassman, 2004). Alerts that are used to populate a display are often delivered via graphical displays in the form of BAM "dashboards" containing real-time values of critical business performance indicators. These corporate dashboards are normally customized for use in different parts of the enterprise and for different audiences (McCoy et al., 2001). Alternatively, or in addition to, the alerts can be sent as messages to specific recipients who are empowered to act, via existing channels such as e-mails, instant messages, pagers, and so forth (McCoy, 2003).

CASE DESCRIPTION

Initial Case: The Weight and Balance Solution

The Quantive BAM solution was first used by Southern International Airlines to design and deploy an event-driven application to improve compliance with FAA regulations. This section highlights this event-driven application by describing the event filtering conditions. In order to characterize the real-time decision support needs of the recipient for these "out-of-balance" BAM alerts, the performance-indicator monitored by the event-driven application and the tolerance for latency are taken into account. Table 1,summarizes the focus of this application.

Table 1. Application characteristics of weight and balance

Application Characteristics	
Performance-Indicators	Position center-of-gravity, total weight
BAM recipient	Operational Managers in the Weight and Balance Department
Tolerance for Latency	Seconds-minutes

For this case, SIA's BAM event-driven application raises alerts whenever significant weight changes occur after the initial flight parameters are set. These alerts, in turn, makes it possible for an operational manager in the weight and balance department to take corrective actions to ensure that the center of gravity is re-positioned within acceptable limits according to the aircraft flight manual before the aircraft takes off, as well as informing the cockpit crew about the actual take-off condition so that they can reset the stabilizer trim prior to take-off.

The primary event source is the Initial Weight and Balance Transaction (IWBT) used by the Flight Operations System, which contains the needed event properties that affect the weight and c.g. of an aircraft. This transaction is first captured at the absorption layer, then processed and filtered to create BAM alerts. The resulting application notifies appropriate BAM recipients (operational managers in the weight and balance department) of significant weight changes occurring that can affect the position of the aircraft's c.g.

Figure 2 provides a screenshot of all event properties captured using Quantive's event definition and absorption software, and contained in the IWBT transaction.

Table 2 shows the particular fields of the IWBT transaction that are captured in order to build the event to be logged and subsequently processed.

Event processing consists of using the resulting ZFW_CG, RMP, and TOW_WT values. Whenever one of those values comes within 2% of the forward and aft limit of the aircraft, an alert is raised and, at the third layer of BAM, a dashboard is updated to provide real-time visibility into this critical performance indicator.

Alerts raised by the weight and balance BAM application are also stored in a database. This makes it possible for SIA to disclose these alerts when reporting to the FAA about the occurrence of significant weight variations along with the corrective actions taken by SIA. In addition, the database is used to improve SIA's knowledge on patterns of balance event occurrences and, as a result, to provide this additional information to the FAA as well.

Table 2. IWBT transaction contains these properties of interest for real-time weight-balance monitoring

Line	***Event Property***	***Description***
4	Flight	The flight number, as seen by the traveling public
5	Date	The numeric day of the month
6	City_org	The origination city
7	City_dest	The destination city
9	ZFW_FWD_Limit	The "forward limit" of the center of gravity
10	ZFW_AFT_Limit	The "aft limit" of the center of gravity
11	ZFW_CG	The center of gravity value at the time of transaction
19	RMP	Aircraft weight before it leaves the gate (Ramp weight)
20	RMP_Max	Max allowed Ramp weight
22	Ballast	Ballast weight the aircraft is carrying
25	TOW	Expected Take-Off weight
26	TOW_Max	Max. allowable Take-Off weight

Follow-on BAM Applications

Although Southern International Airlines' decision to adopt Quantive's BAM solution was initially driven by the need to improve regulatory compliance without disturbing existing transactional systems, once managers began to see the power of re-thinking operational problems and potential solutions in terms of business events and event exceptions, other event-driven applications were identified and subsequently pursued. An additional attraction of the adopted BAM approach was that these applications could be implemented by the operations personnel directly. There was no need to have the IT unit involved in developing these solutions; operation's own people could easily master the identification of transactions moving across the organization's WAN (wide-are network) and create event definitions, filters, alerts, analysis, and display capabilities. This pattern of assimilation and adoption tended to follow the widely studied "diffusion of innovation" patterns documented in the marketing and information systems literature (Rogers, 1995).

At the time of this case (2005), ten event-driven applications, employing event 60 filters, had been implemented by Southern International Airlines. According to Quantive, these 10 applications raise an average of 30 to 40 alerts per day, each indicating a potential exception condition requiring intervention. At that level, the alert recipients are able to respond to all BAM alerts. However, it should be noted that as the number of event-driven applications increases, the risk increases of overloading the alert recipients with too many alerts (McCoy & Govekar, 2002).

In such cases, BAM recipients are likely to start ignoring some of the alerts due to a lack of time to interpret and react upon the information contained in the alert (Klein & Besson, 2003). This situation is often referred to as cognitive overload (of the BAM recipient).

Three of these follow-on applications are given. Each highlights a problem identified by specific business unit managers following the installation and presentation on the original (weight-balance) application. Of these, the first two were successful. A third, while technically feasible and economically attractive, was nevertheless abandoned due to inadequate attention to social constraints.

Freight Refusal Application

Freight refusal presents an interesting problem to SIA, with significant negative financial implications. It involves scenarios in which sufficient cargo space is available on an aircraft but some of the freight booked for that flight is not loaded. This condition is referred to as freight refusal. For the sake of maximizing SIA's resources and revenues, it is obviously important to ensure that the maximum amount of freight booked for a flight is loaded onto the aircraft prior to take-off, especially for perishable goods that quickly deteriorate if they are not loaded and shipped as originally planned (e.g., flowers). In this case, SIA would have to reimburse customers for their resulting loss in addition to the loss of SIA shipping revenue. Since urgency and perishability are two of the primary reasons for using air cargo over other logistical choices, nearly all freight refusal conditions have significant economic and quality of service impacts. Table 3 summarizes the characteristics of this application.

In examining the freight refusal scenario, SIA managers determined that there are both legitimate and non-legitimate reasons for freight refusals. The list of legitimate reasons include lack of space in the aircraft, insufficient time to load all booked freight before the scheduled departure time due to late arrival of the aircraft, the freight itself was not delivered to the airport in time, loading equipment damage, and so forth. In general, non-legitimate reasons result directly from failure of the ramp crew to load awaiting freight.

Table 3. Application characteristics of Freight Refusal

Application Characteristics	
Performance-Indicators	Shipping status
BAM recipient	Supervisors of Ramp Crew
Tolerance for Latency	Hours-Days

Southern International Airlines needed to identify the occurrence of non-legitimate freight refusal so that corrective measures could be taken with the associated ramp crew. However, the effort required investigating the reason for the occurrence of freight refusal and also required a time-consuming search of the flight log. Again, given the large volumes of data stored there, such an analysis was rarely undertaken and disciplinary measures seldom initiated, while non-legitimate freight refusal continued to occur.

The basic pattern for freight loading was then examined for the existence of signal events that could aid in identifying cases of freight refusal. For every flight of Southern International Airlines, there is a ramp controller who is in charge of registering the status of booked freight in a manifest document (transaction) provided by the flight operations system. In the case of freight refusal, the ramp controller is supposed to register the reason for not loading the booked freight.

The event-driven application designed to tackle the non-legitimate occurrences of freight refusals work was based on monitoring the execution of transactions containing cargo information. Basically, after the first IWBT is executed, a system transaction (the Cargo Transaction) containing event properties pertaining to cargo, is also executed. These two transactions, in turn, provide the basis to develop a set of event rules and BAM application that would provide real-time notification of the occurrence of non-legitimate freight refusals.

While the actual set of transaction events and associated properties used is complex, to provide a sense of this application, a few simplifications are made. First, the Cargo Transaction contains an event property that identifies each product to be shipped, which is called PIC (Product Identification Code). Second, there is an event property to indicate the status of all products that are booked for shipment on a specific flight, called SPBS (Status of Products Booked for Shipment). SPBS can assume the values:

- *Confirmed*, meaning that product is ready for shipment
- *Cancelled*, meaning that a legitimate reason exists for not shipping the product according to shipment book
- *Shipped*, meaning that product was loaded into the aircraft

The event logic then becomes that of comparing the change of SPBS values during the loading process. Specifically, alerts are generated indicating non-legitimate freight refusals by searching for *confirmed products* that do not change their status to *shipped* in the course of the loading process. By this logic, it is possible to identify a possible failure of the assigned ramp controller for this flight to load that particular product shipment.

Monitoring Flight Planners

The allocation of passenger-sensitive resources to a particular flight is the responsibility of SIA's flight planners. Such resources can range from the number of meals carried to the fuel to be loaded on the plane. SIA management sought a way to develop an event-driven application to monitor the individual performance of flight planners with respect to optimal resource allocation. It is important to mention that flight planners' work in a non-unionized department, otherwise such monitoring would likely be opposed by their representation union officials. Table 4 highlights the properties of this application.

The event-analysis approach taken here relied upon two transactional events occurring within the flight operations system: the IWBT transaction and a Passenger Destination Transaction (PDT). After the IWBT is executed, the flight operations system executes a PDT transaction that contains properties indicating passenger destinations. The analysis showed that the Passenger Destination Transaction is executed automatically for the first time between 150 and 92 minutes prior to departure.

By aggregating the PDT's at a particular time point, one can compare the number of passengers at a particular point in time with the passengers indicated from a preceding point in time. This, in turn, can be compared to the flight planner's resource allocation for the flight (from a different transaction). In principle, the passenger configuration of a flight should not vary significantly, especially as the time of departure approaches. Variations beyond a pre-determined, SIA-specified level, can signify that the flight planner is not keeping up with the changing status of the flight in a proper way.

Using this application it becomes possible for SIA management to analyze the performance of individual flight planners with respect to their allocating resources to their assigned flights and identify those flight planners who may need additional training and/or mentoring.

And, while this application was a post-mortem analysis, the same logic could be used to provide event alerts to the flight planner and/or his/her supervisor in real-time.

Table 4. Application characteristics of monitoring flight planners

Application Characteristics	
Performance-Indicators	Variation in number of passengers near flight departure
BAM recipient	Supervisor of Flight Planners
Tolerance for Latency	Minutes-Hours

Monitoring Dispatchers

Not all event-based applications that were considered by SIA were successfully deployed. At the beginning it was acknowledged by the Quantive-provided trainers and developers that organizational resistance could be an obstacle to the deployment of some event-based applications. This proposed application is one such example.

The way of event-thinking that resulted in the preceding flight planner monitoring application led SIA management to consider extending the concept into an application to monitor the dispatchers that provide information support to the cockpit crew. The idea was to monitor whether dispatchers were paying sufficient attention to all flights by examining a combination of transactional events drawn from the flight operations system to assess the frequency and duration of message interactions between the cockpit crew and the dispatcher, as suggested in Table 5. However, this prospective application did not proceed beyond the conceptualization phase.

In contrast to flight planners, the dispatchers work in a unionized department. For this reason, the proposed development of an event-driven application to monitor individual performance of dispatchers triggered fierce resistance from their union. To avoid possible conflicts with the union, the decision was taken to cancel any further development and deployment of this application. The experience gained with this attempted application demonstrates that an application that is technically and economically feasible can be socially infeasible. As such, the organizational setting becomes a very important aspect to be taken into account when considering event-driven monitoring applications.

CURRENT CHALLENGES FACING THE ORGANIZATION

A first challenge arises from the fact that many of Southern International Airlines business processes are highly regulated. As new regulations are added, these

Table 5. Application characteristics of monitoring dispatchers

Application Characteristics	
Performance-Indicators	Time length of communication between cockpit crew and dispatcher
BAM recipient	Supervisors of Dispatchers
Tolerance for Latency	Minutes-Hours

in turn require SIA to implement new, real-time control systems to monitor for compliance. However, in order for SIA to comply, they must continue to rely on their legacy transactional systems, which were not designed to comply with such regulations. The challenge, then, is to overlay the existing systems with a new layer of processing that is transparent to the functioning of the existing systems while providing the needed regulatory compliance. While SIA was able to do this for the weight balancing regulation, there are many other regulations requiring compliance that must also be met in a cost-effective fashion. For example, the arrival of Sarbanes-Oxley (SarbOx) requires, among other things, the monitoring and control of various financial transactions and the early reporting of material events affecting financial disclosures "Section 409 is also important because material changes affecting financial disclosures must be reported on a rapid and current basis. This means systems must be able to provide timely information within days, not weeks, of an event." (Kaarst-Brown & Kelly, 2005, p. 2). Can an approach similar to the FAA compliance problem be taken to this set of regulations? If so, how does one expand the other areas of the organization, base of knowledge gained by the SIA flight operations managers in ways of event-thinking?

Another challenge (or more correctly, opportunity) faced by Southern International Airlines, once they had their initial BAM capability in place, was to re-think non-compliance-related problem-solution scenarios in event-based terms. As this case points out, there is a type of "ah-ha" moment that seems to occur when (some) managers begin to re-interpret other problems they are having in a manner that fits an event-stream, BAM-like solution. While SIA could continue to rely on random awakenings to form the strategy for their next applications, is there a better way to identify opportunities and determine which of these are most applicable for solving using a BAM approach? Conversely, how should one avoid over-use of such a capability—the all-too-familiar problem of a solution looking for problems?

A third challenge that is associated a broader application of BAM-style application, particularly into areas with higher exception frequencies, is the already mentioned "alert overload" problem. Even though the number of alerts per day has been relatively small for the applications implemented to date, an increase in the number of event-driven applications could easily overload BAM recipients with too many alerts in much the same way that e-mails have done. While the volume of alerts can obviously be throttled back by more aggressive event filtering, this gives rise to the well know statistical problem of Type I and Type II errors, for example, rejecting events that should be seen versus accepting events as alerts that are not important. Can risk analyses similar to deciding Type I vs. Type II error levels be applied here? Or, are there other, better ways to accomplish this, drawn from (say) the area of Decision Support Systems?

A fourth and final challenge is how organizations in general, and SIA in particular, should anticipate and overcome organizational issues and constraints that often accompany real-time monitoring situations. As with any system change, technical and economic feasibility are not the only pre-conditions for a successful system implementation and change. It is widely known that "social failures" (i.e., the rejection of the system by the users themselves) are a major, if not primary cause of IT implementation failures. The last case discussed illustrates that unionized departments strongly tend to oppose the implementation of applications designed to monitor individual performance of employees. But more employees in general (unionized or not) are averse to having their work monitored in real-time, particularly when the monitoring results in disciplinary action. And, while they may not be able to prevent its implementation, as the unionized employees were in this case, there are many other ways they can cause the resulting system to fail.

It should be noted, however, that BAM-style monitoring solutions are not inherently punitive; they can be used proactively as well as reactively. For example, in the case of dispatcher monitoring, the alerts could instead be sent to the dispatchers themselves as a stimulus to them to increase their engagement with the specific flight crew. Rather, from the applications presented (both implemented and withdrawn) it appears that SIA management is of the "Theory X" style and some of the BAM solutions implemented allow them to become even more so. How, then could the developers of these solutions approach their design so that the result to monitoring is more proactive/supportive rather than reactive/punitive? Should they? More generally, could/should BAM development adopt a socio-technical approach (Bostrom & Heinen, 1977; Mumford & Weir, 1979) to development so as to enhance implementation success, rather than the more mechanistic development approaches taken from real-time mechanical control system design, where the objects being monitored are machines rather than humans?

CONCLUSION

The implementation of a BAM solution at Southern International Airlines resulted in significant improvement of the event-response capabilities of the airline without having to modify or add to existing transactional systems and in time frames measured in days and weeks rather than months or years. The benefits produced by the projects described include: better regulatory compliance, reduction of operational costs, improved flight safety, greater management visibility into on-going operations, and improved customer service. As with any new set of concepts and tools, the standard pattern of innovation diffusion can be observed as potential users of the system slowly begin to re-cast problems they may have in terms of events, real-time event monitoring and alerts. This diffusion is made particularly difficult in that the development of event-driven applications requires a combination of knowledge about business processes, regulations, transactional systems, and the BAM solution itself. A final consideration of the cases presented suggests the need for a broader framework and methodology base that addresses and integrates all the many aspects involved in an event-driven BAM implementation project and its subsequent implementation success.

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APPENDIX A. TECHNICAL NOTE ON BAM SOLUTIONS

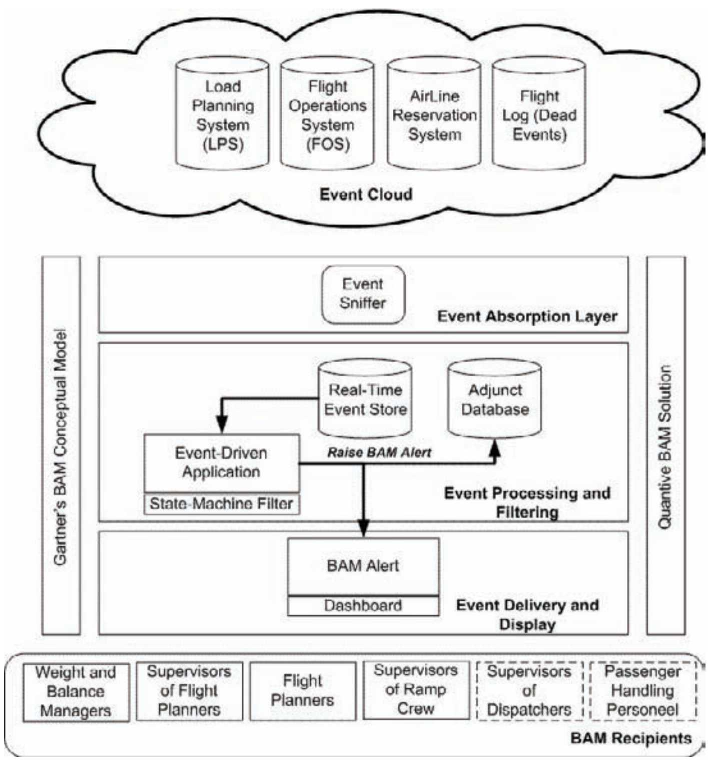
Business Activity Monitoring is a comparatively new concept, first introduced ca. 2002 in the professional literature (McCoy, 2002) and appearing in the academic literature ca. 2004; primarily in conference proceedings (cf. Golfarelli, et al, 2004). In order provide additional insight into SIA's implementation project, additional details regarding the Quantive BAM solution are provided below.

Figure A-1 places the Quantive BAM solution within the SIA flight operations "event cloud" of generated transactions and adopts the nomenclature of the previously presented Gartner conceptual model for BAM. At each level, the Quantive BAM solution provides products or built components that represent their approach to the functional need associated with the generic BAM model level.

Event Execution

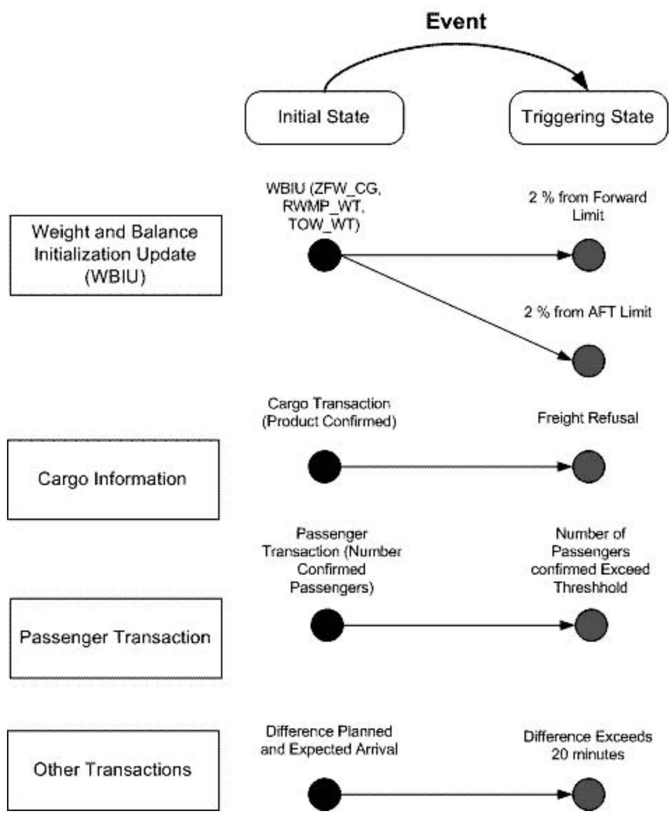
For the initial SIA weight-and-balance application, the primary event of interest is considered a "complex event," for example, one that is defined as the occurrence

Figure A-1. Functional components of the quantive BAM solution



of several basic transactional events that occur in a predefined sequence. For this application, the initial weight and balance transaction (IWBT) is the initiating transaction (triggering event) indicating the existence of a flight. The IWBT contains the basic flight information and the first execution of this transaction confirms that a flight is scheduled for departure within about 4 hours. There is a timing relationship between the IWBT and the other transactions carrying information about a certain flight. After IWBT's detection, a transaction sequence containing transactions about basic flight information regarding passengers, freight, fuel, and other elements of the flight occurs. Figure A-2 illustrates the associated events of interest that are then monitored by event-driven applications that were deployed by Southern International Airlines. When a pre-specified set of transactions and their associated events occur with specific values, a complex event of interest to the weight-and-balance application is then said to occur.

Figure A-2. Set of events of interest monitored by Southern International Airlines



Event Sourcing

The primary source of events for this implementation project is the flight operations system. This is a widely distributed, message-based transactional system that is responsible for managing resources of all flights of Southern International Airlines throughout the world. The flight operations system supports transaction-based applications used by SIA's personnel to carry out business processes related to flights. Alongside the flight operations system, Quantive's BAM solution also monitors event streams output by other systems that interact with the flight operations system, such as the Loading Planning System (LPS) and Southern International Airlines' reservation system. The LPS is a subsystem of the flight operations system, which was designed to automate the load planning processes. The LPS sits on the top of the flight operations system, but executes underlying transactions that require data from both the flight operations system and the reservation system.

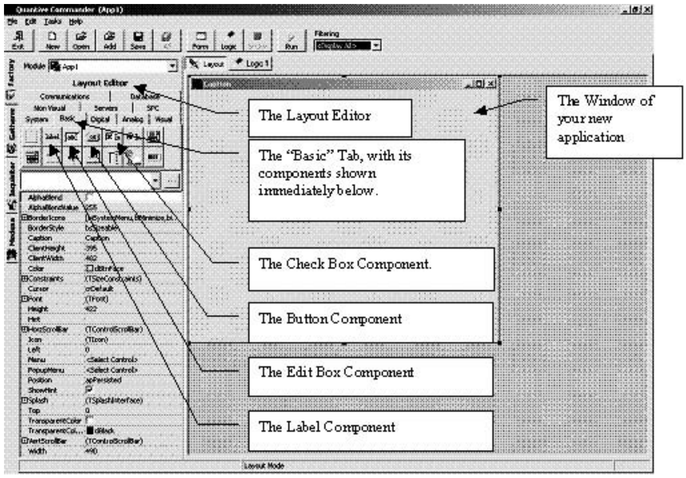
To acquire all the raw transactional events, Quantive's solution literally taps into SIA's switched LAN and, using transaction definition filters created by SIA's operations personnel, it reconstructs the packets of data moving into complete images of the various transactions moving across SIA's corporate network. More generally, any transaction moving over the LAN can be defined, captured and logged in this manner.

Developing an Event-Driven Application with Quantive Tool Set

Quantive's BAM solution includes an application development environment called the Quantive Factory. This environment provides business event modeling tools to specify event selectors used by applications to detect both single and complex events of interest. The application development environment, which is illustrated by Figure A-3, includes modeling functions that can be used to specify the performance indicators to monitor, logic formulas to characterize a complex event pattern corresponding to an exceptional situation of interest, and the characteristics of the alert to be issued when the defined, complex event is detected. Alerts are normally delivered by graphic displays "dashboards" that are customized for different BAM recipients, although as in the SIA case, they were also sent as (real-time) messages to appropriate devices (pagers, PDA's).

The interface of the Quantive Factory was designed for use by business managers, rather than IT developers. As such, complete applications can be and were developed without the need for IT-specialist knowledge. For this reason, the development cycle of event-driven applications was much shorter then would be the case for conven-

Figure A-3. Graphical user interface of quantive's event-driven application development environment. source: quantive



tional IT applications. Each of the applications discussed in this case took days or several weeks to develop and implement and in some cases, less than a day. It also provides a much higher degree of "ownership" by the business unit itself, as well as providing a tool for subsequent adaptation and experimentation.

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Chapter XVIII
Competing in the Age of Information Technology in a Developing Economy:
Experiences in an Indian Bank

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Executive Summary

This case describes how banking in India has changed after developments in information technology in the last decade. The new private and foreign banks, which are strong in technology, are giving tough competition to old public sector banks. Private banks have pioneered Internet banking, phone banking, anywhere banking, mobile banking, debit cards, automatic teller machines (ATMs), and retail banking in urban India. This case is about the VN Bank, a public sector bank that has to formulate its strategy in order to compete in this new environment. The case also explores the opportunity and challenges for the bank in rural India and makes readers think about how information technology can help the bank in building a strong position in the rural markets. The findings of the case study also can be generalized across

other developing countries, where domestic companies are facing tough competition from foreign and private players.

ORGANIZATION BACKGROUND

Veerat National (VN) Bank was founded on November 14, 1939, by the family of Anupam Chandra under the name Veerat National Banking Company Ltd. It became a Public Ltd. Company in December 1944, and subsequently, the name was changed to Veerat National Bank Ltd. In July 1969 VN Bank Ltd., along with 13 other major banks, was nationalized and is currently a Public Sector Bank (PSB) constituted under the Banking Companies (Acquisition & Transfer of Undertakings) Act of 1970 (see Appendix I to understand the Banking History in India). The bank's comparative performance over the last three years is shown in Table 1. The income statements over the last two years are shown in Table 2. The interest income of the bank amounted to $158 million for the year 2003-2004 compared to $151 million for the year 2002-2003, showing a marginal rise of 2.08%. The amount of interest expended also has declined by 5.06%. The non-interest income of the bank has registered an impressive growth of 41.28%, thereby reaching a level of $167 million for the year 2003-2004 compared to $116 million for the year 2002-2003. VN Bank has a network of 1,368 branches in the country and has 12,461 employees. The number of branches statewide is given in Appendix II..

Table 1. Veerat National Bank yearly comparative performance

Particulars.$.Mn.	2001-02.	2002-03.	2003-04
Number of Branches	1368	1368	1368
Number of Computerized Branches	809	1034	1106
Reserves and Surplus ($ Mn)	165.6	175.2	193.56
Capital Adequacy Ratio (%)	7.64	6.02	9.48
Deposits ($ Mn)	4094.64	4397.64	4893.12
% Increase	5.36	7.4	11.27
Advances Net ($ Mn)	2006.16	2249.64	2509.92
% Increase	7.4	12.14	11.57
Investment ($ Mn)	2059.68	2289.36	2605.56
% Increase	12.2	11.14	13.81
Operating Profit ($ Mn)	89.4	131.64	189.5
Net Profit/Loss ($ Mn)	0	30.5	61.5
Total Staff (No.)	12,840	12,664	12,416
Per Employee Business ($ Mn)	0.5	0.54	0.6
Per Branch Business ($ Mn)	4.5	4.8	5.8

Table 2. Veerat National Bank income statement (in million dollars)

Particulars.	2002-03.	2003-04.
Interest Income	472.56	462.7
Interest Expended	321.12	304.8
Net Interest Income	151.44	157.9
Non Interest Income	116.52	164.6
Operating Expenses	136.32	133.0
Operating Profit	131.64	189.4
Provisions and Contingencies	101.28	128.0
Net Profit	30.48	61.46

SETTING THE STAGE

Changes in Indian Banking After Liberalization

Mathur (2002) stated that PSBs have been exposed to an increasingly competitive environment through (a) entry of new private banks, (b) relaxations on the entry of foreign banks (branches only), (c) near total deregulation of interest rate structure, and (d) increased functional autonomy and operational flexibility in a large number of areas for PSBs. After the second phase of financial sector reforms and liberalization of the sector in 1992, the new private sector banks first entered into business after the guidelines permitting their entry were issued in January 1993. These private and foreign banks, due to their late entry, had access to state-of-the-art technology, which, in turn, helped them to save on manpower costs and to provide better services. Table 3.provides the.cost by channel data, which shows why private sector banks were inclined toward these new channels. In the case of private banks, bank automation was relatively easier, given that their size was small and that they started their operations afresh. Foreign banks already had the advantage of good automation experience in several banking applications (Kaujalgi, 1999). The private players, however, cannot match the PSB's great reach, size, and access to low-cost deposits. Therefore, one of the techniques in order for them to compete with the PSBs has been through the merger and acquisition route, taking different delivery channels and customization of services. Private sector banks pioneered Internet banking, phone banking, anywhere banking, mobile banking, debit cards, automatic teller machines (ATMs), and customized services to consumers.

The diffusion of technology was somewhat slow in PSBs compared to private banks and foreign banks (Banker, 1998). Wolcott and Goodman (2003) stated that liberalization in India resulted in an emphasis on service quality, process ef-

Table 3. Cost by channel

Channel.	Cost.($).per.Transaction.
Branch Transaction	1.11
ATM	0.33
Internet	0.09

Table 4. Number of branches and ATMs HDFC, ICICI, UTI, SBI, and VN Bank

	.B ranches.	ATMs.
HDFC.Bank.	231	732
UTI.Bank.	223	1108
ICICI.Bank.	540	1675
SBI.Bank.	9038	3900
VN.Bank.	1368	112

Table 5. Declining branch business for ICICI bank

Transactions	.A pril.2000	.A pril.2002.	April.2003.
Branch	88%	37%	28%
ATM	4 %	52%	53%
Internet	2 %	4%	8 %
Customer Care	6%	7 %	11%
Total	100%	100%	100%

ficiency, and overall modernization in both the public and private sectors. Furey (1991) suggested that IT can help to enhance service quality of banks by increasing convenience, providing extra services, and collecting service performance information for management use. Fitzsimmons and Fitzsimmons (1997) recommended several competitive roles of IT in services, such as the creation of entry barriers, the enhancement of productivity, and an increase of revenue generation from new services. One of the most cited contributions of IT-based service enhancements was convenience (Allen, 1997; Baily & Gordon, 1988; Cline, 1997; Milligan, 1997; Reed, 1998). To customers, convenience referred to a generous number of accessible service delivery points that were available when customers needed them. Some scholars noted that IT-based service options might indirectly improve customer service, because such types of service provide the means for gathering customer data. Customer data control can be useful in managerial decision making in order to improve operational efficiency and service quality (Cline, 1997; Furey, 1991; Randle, 1995).

Table 4 provides the details of branches and ATMs of five banks, three private and two public sector banks (State Bank of India [SBI] and VN Bank). Table 5 details declining branch business for Industrial Credit and Investment Corporation of India (ICICI) Bank.

Tables 4 and 5 show the shift in the theory of banking business in India due to developments in IT. In new banks, the number of ATMs are three times the number of branches. The declining branch business of the ICICI bank indicates the shift in the preference patterns of consumers. Drucker (1994) mentioned that a *theory of the business* has three parts. The first part is that there are assumptions about the environment of the organization: society and its structure, the market, the customer, and technology. Second, there are assumptions about the specific mission of the organization. Third, there are assumptions about the core competencies needed to accomplish the organization's mission. Drucker (1994) further mentioned that the theory of the business has to be tested constantly because it is a hypothesis about things that are in constant flux — society, markets, customers, technology. When a theory shows the first signs of becoming obsolete, it is time for the organization to start thinking again, to ask again which assumptions about the environment, mission, and core competencies reflect reality most accurately.

Banks in India traditionally have claimed the strength of their networks based on the number of branches. The logic was that the increase in branch network corresponds to more transactions, more business, and therefore, more profits. But now, things have changed, as shown in Tables 4 and 5. The PSB, which has realized and understood this change early, is investing aggressively on the technology front. SBI Group was a slow starter in the ATM game but now has built up an impressive network of more than 3,900 ATMs, the single largest ATM network in the country. Even a relatively smaller PSB like the Corporation Bank is relying on ATMs to expand its business. In a single year, the Corporation Bank has networked 185 ATMs, and it now has the second largest ATM network among public sector banks. PSBs are realizing the benefits of managing ATM networks compared to running branch networks, and banks also are encouraging customers to make the switch, as well. Like other banks, VN Bank also has set up 112 ATMs.

Banks are using ATMs and desktops to offer utility-based services because of the convenience factor to customers. Corporation Bank, for example, has introduced Corp BillPay, a utility payment facility in select cities. Through this, bank customers either can issue standing instructions to their bank for paying their utility bills or Life Insurance Corporation (LIC) premiums, or, alternatively, they can go to the online facility to view and pay bills over the Internet. The SBI ATM at central railway station in Mumbai also dispenses season tickets. Analysts believe that as banks discover the marketing power of ATMs, they will see a trend where ATMs will be used to deliver products of other vendors, as well. ICICI Bank has gone one step further by allowing devotees of Tirupati god to offer payments to the temple at Tirupati through their ATMs. Normann and Ramirez (1993) mentioned that ATMs have made a change in the entire *value*-creating system of banking services. The scenes, the script, and the roles of the relevant actors have been radically transformed by ATMs. They mentioned further that the goal of business is not so much to make or do something of *value* for customers but to mobilize customers to take advantage of proffered customized services and to create *value* for themselves by making use of such services. On technological advancement, Mr. Krishna, IT officer in VN Bank, mentioned:

Half of our branches are located in the rural and semi-urban areas without Internet facility. Further, the installation of ATM costs $40,000 and there should be at least 300 transactions daily to arrive at break even. In some places, we have removed ATM due to consideration of cost. In India, about 65% of the population lives in semi-urban and rural areas, where there are many problems in banking. Some of such problems are low profitability, large number of accounts, and transactions are less in number and low in value. There are few activities and less opportunity for services other than deposit and credit, huge staff cost, difficult to implement technology, large coverage area of operation, difficult reach, and staff unwilling to serve in rural areas.

In regard to the decrease in operational cost due to the introduction of the low cost channel, Singh, an expert at the Reserve Bank of India (RBI), India's central bank, adds:

Since the late 1990s, public sector banks in India have been focusing on different channels of transaction, mainly to compete with private banks. But they have not been very successful in getting their customer transactions to migrate from the from the high-cost branch networks to lower-cost electronic channels such as ATMs, PC banking, and online banking. One of the reasons could be the heterogeneous customer profile of these public sector banks. Many banks have encouraged customers to alter their transaction behavior by attempting to educate them about the availability and convenience of these alternative lower-cost channels to de-emphasize the [higher-cost] branch network. However, the convenience factor has encouraged customers to increase transaction volumes to a level which offsets cost saving. For example, people earlier withdrew money once or twice a month, but now, due to ATMs, withdrawals have increased to five to six times per month.

Each additional channel has provided the opportunity to reduce cost per transaction over the previous channel for banks and has increased flexibility for customers. This addition further caused customers to increase the number of transactions with the bank by the addition of each new channel (ATMs, Internet). But the problem starts when the number of transactions reaches such a level that it supersedes the cost saving for the bank. D'Souza (2002).stated that.the profitability of public sector banks did improve relative to the private and foreign banks in post-liberalization period, but they lost ground in their ability to attract deposits at favorable interest rates in their slow technological upgradation and in their staffing and employment practices, which has implications for their longer-term profitability.

Advances in banking mainly have taken place in urban areas of India. In the last decade, the level of urbanization also has increased. The share of urban and metro population increased due to migration from rural to semi-urban to urban to metro. In urban and metro, population per branch has decreased, whereas in rural and semi-urban, population (about 650 million) per branch has increased during the last decade..In India, there was a total of 67,897 bank branches in the country in 2002; 32,443 or 47.7% was in rural India. The average population served by a bank branch was 15,000. Fifty-eight percent of the rural households does not have a bank account, and only 21% has access to credit from a formal source. Over 70% of marginal farmers has no deposit account, and 87% has no formal credit. Only a little over 1% of rural households can rely on a loan from a financial intermediary to finance unforeseen expenses. Approval for such loans takes between 24 and 33 weeks. Often, consumers need to bribe officials to get loans, with the bribe varying between 10& and 20% of the loan amount. In 2002, the number of rural deposits was 30.2% of the total deposits in the banking system. However, the amount of deposits mopped up in rural India is only 14% of the total deposit liability of the system. Similarly, there are 560,000 rural advance accounts, which is 44.5% of the total number of advance accounts. However, the share of rural pockets in the total credit kitty is only 14%. Overall, 18% of the rural population has bank accounts. The comparative figure in urban India is 103%. It is clear that the supply of formal finance is biased against the rural population. The per capita deposit in rural areas stood at $50. In contrast, in urban India, it is $800. Credit per person in rural India is $25 compared to $600 for urban centers. The number of credit accounts in rural areas relative to the total rural population is only 3.4% compared to around 10% in urban areas.

These differences are hindering the progress of the country. Professor Malhotra, Economics Department, Jawaharlal Nehru University (JNU), commented:

It is the responsibility not only of the government but also of banks, insurance companies, corporate, social service organizations, NGOs, even individuals to work for *the synergy of urban and rural India. Public Private Participation (PPP) is essential for the development of rural economy. More and more corporates are planning to enter into agriculture for large-scale tenant farming and building cold storage in rural/semi-urban places; state governments are developing e-governance Web portals. With such initiatives, our rural India will grow and contribute significantly to the national growth.*

The honorable president of India, Dr. APJ Abdul Kalam, has posed an important reflection before the nation for bridging the rural-urban divide and for achieving balanced socioeconomic development. He has initiated a project called PURA — Provision of Urban Amenities in Rural Areas. Indian companies like Indian Tobacco Company (ITC) have taken up e-choupal initiative. Through the e-choupal initiative, ITC aims to confer the power of expert knowledge on even the smallest individual farmer, thus enhancing the farmer's competitiveness in the global market. Multi-National Companies (MNCs) like Hewlett Packard (HP) also have initiated a program called e-inclusion in rural India. These initiatives are described in detail in Appendix III.

Another area that has developed in banking is Retail Banking. Retail loans, which for years were less than 5% of bank advances in India, account for a lion's share of bank advances in developed markets. For instance, it ranges from 45% to 70% for the USA and 65% to 75% for Switzerland. However, banks in Asian countries do not have as high of an exposure in the retail segment. The retail portfolio to total advances in China, Malaysia, and Thailand ranges between 10% and 20%, while in South Korea, it is about 30%. Large Indian banks like HDFC Bank, ICICI Bank, and HSBC India are expecting to achieve a retail portfolio of 50% of advance within the next couple of years, while SBI is targeting to increase retail assets to 30%. At present, VN Bank retail loans account for a mere 8% of the bank's total advances. The bank has a lot of catching up to do in order to match its peers in this respect. VN Bank has taken some steps in the direction of retail banking such as housing loan scheme, tractor finance, insurance, and so forth, which will be listed in the next section.

CASE DESCRIPTION

Veerat National Bank in this Competitive Environment

Like other banks, VN Bank also embraced technological advancements; 1,106 branches out of its total 1,368 branches are computerized, and 720 are fully computerized. The facility of Multi-Branch Banking (MBB) is available at 215 branches covering 42 centers of the country. At present, there are 112 ATMs of the bank. The bank has introduced a telebanking facility in selected metropolitan centers. It also has introduced the system of credit cards in rural India, known as VN Farmer's Card. It also has drive-in ATM counters at Madema, Chennai, and smart card at selected branches in Chennai. There is also a customer rating system for rating the bank's services. VN Bank has launched its International Debit Card in association with Visa Electron. The card is available free of cost to all VN Bank account holders who maintain a quarterly minimum balance of $150. Alternatively, the card can be acquired at an annual fee of $5. Cardholders will have global access to cash through the Visa ATM network in addition to the bank's own ATMs. The Visa network covers more than 3,500 ATMs across India and more than 780,000 ATMs globally. VN Bank also has gone for a strategic alliance with a life insurance company. The bank is providing insurance products to its customers from its branch networks with a charge of a referral fees. It also has entered into an agreement with a tractor manufacturer for the retail financing of tractors to Indian farmers. Though VN Bank has adopted strategies to remain competitive, the competition posed by the private sector banks cannot be ignored. Talking about the success of private sector banks, a senior VN official remarked:

They have many advantages over us: First, their front desk employees are not permanent; they are on contract. Second, they have a flexible structure Teller-me-type *(can offer customized services). Third, there is distribution of power to the staff, especially branch managers. For example, with regard to the recent RBI policy of Know Your Customer (KYC), since I am in a public sector, I have a problem implementing it. Why? Because I have to send a staff member from the bank to the customer's place to get verification. This is a non-routine job, and I have to do it with the existing staff. Had I been in a private bank, I would have outsourced people who could go out and get the job done. But here, we can't make these decisions.*

Joshi and Joshi (2002), in their book titled *Managing Indian Banks*, mentioned:

The adoption of IT in the nationalized banks in India, which commenced in the mid-1980s, had been fraught with issues regarding acceptance of process changes and the fear of job losses due to automation. Employee unions, perceiving that their concerns had not been adequately addressed, had offered considerable resistance and had significantly slowed the process of IT adoption in the banks.

Banks compete in the marketplace with generally undifferentiated products, and hence, service quality becomes the primary competitive weapon (Kim et al., 1998; Stafford, 1996). Past researchers have shown that improved service quality and customer satisfaction leads to higher productivity (Reicheld & Sasser, 1990), increased loyalty (Reichheld, 1996), lower transaction cost (Bolton, 1998), price premium (Anderson, 1996), favorable word-of-mouth referral (Anderson et al., 1994), market share (Fornell et al., 1996), repurchase intention (Kordupleski et al., 1993), and customer retention (Rust & Zahorik, 1993). Private banks charge customers on the facilities that they provide (e.g., there is a limit on the number of transactions; the minimum balance should be $200 for a savings account). On loans, they charge a fee of $10, and so forth. Regarding these service charges, the Okhla branch manager of VN Bank mentioned:

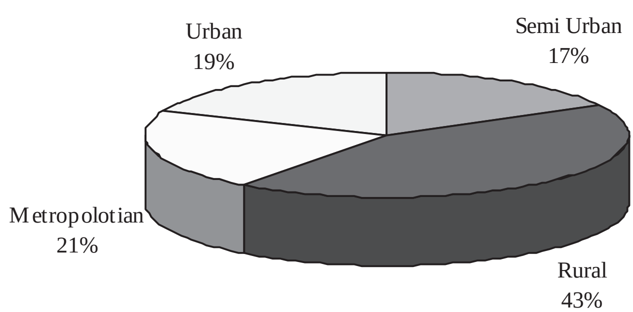
If you look at the consumer profile and locations of the private banks, they are catering to upper class or the upper middle class in metros and some big cities. We have got consumers of all types: uneducated, class-four employees, etc. Private banks put a fine when the balance is less than $200. But many customers of this branch are getting monthly salaries less than $200. And this is true for other parts of India, especially in rural India, were account holders are many but money in transaction or deposit is very less.

Figure 1 provides an idea for the distribution of the branch network of VN Bank. From Figure 1, it is clear that VN Bank draws the majority of its customer from the rural areas.

On the issue of taking technology to rural India for aggressive rural banking, chief technology officer of VN Bank mentioned:

There are many limitations in introducing technology to rural India. First, IT requires uninterrupted power supply, which is not available there; second, communication networking by cable is very expensive. Third, villages are sparsely distributed, with

Figure 1. Veerat National Bank Branch Network



large distances, low requirement of banking services, and lack of good roads and transport facilities. Fourth, there are few people with technical knowledge in the rural areas; technicians for troubleshooting/upgrading/maintenance of the IT infrastructure have to come from nearby towns, which is time consuming and expensive. And for similar reasons, alternate delivery channels to rural areas are difficult.

While the banking industry was in a state of flux, the customers were evolving, too. The media boom, information technology (IT) developments, and the advent of several satellite channels changed customer attitudes further. Sophisticated ambience and customized services of banks have raised the customer expectation level in terms of quality and service. Prahlad and Ramaswamy (2004) mentioned that the modern customer is active, informed, and connected, and hence, the traditional firm-centric approach of business will not work. Firms now have to pass on more value to customers and involve them in cocreation of value. Sureshchandar et al. (2003) focused on investigating the critical factors of customer-perceived service quality in banks of India. They compared and contrasted the three groups of banks in India with respect to the service quality factors from the perspective of the customers. Customers perceived that the technological factors (core service and systematization of the service delivery) appeared to contribute more in differentiating the three sectors; vis-à-vis, people-oriented factor (human element of service delivery), which contributed less to discrimination. Singh, a customer for 15 years with the VN Bank and director of AJZ Ltd., said:

The day-to-day dealing with the staff is okay. The staff is very cooperative, and I am very comfortable here. But very few people are aware of the bank; it is not visible like other public sector banks may be due to regional concentration of the bank. The loaning process is also complicated compared to other PSUs, PNB, and SBI. There is no customer toll-free number. There is no centralized data server. Door-to-door facility (private banks are giving) is absent in the bank.

On the loaning process, Okhla, Branch Manager of VN Bank, commented:

It is the Branch Manager's decision to give a loan or not, and later on, he also has to follow up with the party. Here, people come with different types of loans—loan for manufacturing, loan for export-import business, loan for construction business, etc. I have a Masters in History; sometimes I face difficulty in finding out the feasibility of these projects. The responsibility is completely on us. While in the case of private banks, if the manager has difficulty, he will immediately consult with the specialist sitting in the head office, and their communication is very fast due to a good communication network of information technology.

A 42-year-old customer of VN Bank, Mr. Seth, mentioned:

Today, I am associated with VN Bank only due to cordial and friendly staff relations, prompt and personalized service, and for that extra effort put in by the entire staff to accommodate us in each and every situation. We really appreciate the branch manager and the staff from the core of our heart. The only thing which hinders the growth of the VN Bank vis à vis other private and MNC banks is the system and its effective implementation. Changes in policy matters from top management are required. More power should be given to the branch manager and higher-level staff to work fast so that they do not have to rush to the regional office on small issues. Though computerization, etc. is in place, still paper work has not reduced at all. There is an urgent need to replace outdated dot matrix printers where we cannot differentiate between 0 and 8. Bank stationery needs to be replaced, especially for FOREX (foreign exchange) transactions. The staff is burdened with extra laborious tasks that hamper their productivity. Top management should avoid frequent transfers of branch managers and FOREX department people. It has been observed that before the person is able to settle down and start functioning in the branch, he is transferred to some other branch.

On the complaints of customers about the infrastructure of the VN Bank, Senior Manager Mr. Mathew, in the regional office, said:

The infrastructure of these private banks is new. Our infrastructure is old. We have to incur huge investment, if we go for rapid upgradation. No doubt, the return may be high, but risk is also high. That's why we have followed a middle path. We are upgrading but not at their pace.

Mohan et al. (1990) mentioned that managers in public sector enterprises are not enthusiastic about using Information Systems. The primary reasons given by him are a low comfort level with the use of computers and a lack of awareness of applications relevant to the organization. Nidumolu and Goodman (1996) suggest that perceptions toward IT can change from unfavorable to favorable as more projects are undertaken and more functions are computerized. Change management has been suggested as an especially important issue in government organizations because of their entrenched processes (Caudle et al., 1991). As Joshi and Joshi (2002) have pointed out, it is relatively easier to work toward a middle and lower management commitment after a top management commitment has been secured. In a study of e-government initiatives in the Indian state of Kerala, Kumar (2003) reports that top management drive has been an important issue in driving IT adoption in various government departments and has facilitated the acceptance of IT at lower organizational levels. Studies by Amabile (1996) have suggested that the work environment often becomes negative in times of new technology implementation and significant business process changes. This is because the difficulties associated with adjusting to the changes often result in collective cynicism and confusion. *Zhu et al. (2002) found the impact of* IT on service quality in the consumer-banking sector. Their results indicate that IT-based services have a direct impact on the service quality dimensions and an indirect impact on customer-perceived service quality and customer satisfaction. Their analyses also showed that customers' evaluations of IT-based services are affected by their preference toward traditional services, experiences in using IT-based services, and perceived IT.

CURRENT CHALLENGES/PROBLEMS FACING THE ORGANIZATION

Future Banking Scenario: Challenges and Opportunities for VN Bank

Rajeev Sharma, Chairman and Managing Director (CMD) of VN Bank, is worried about the latest Financial Express India's Best Bank Survey in 2003-2004. VN Bank is ranked 25th among the 27 Nationalized Banks in the country. The ranking criteria and VN Bank's ranking on those criteria are provided in Table 6. Other causes of concern include the decline of market share of VN Bank in deposits and advances, from 1.22% and 1.21% as of March 2003, to a further decline of 1.16% and 1.17% as of March 2004. VN Bank's share in the booming retail segment is much less (about 8%) compared to other banks (30% to 40%). Only 28% and 25% of the branches were able to achieve their core deposits and net advances target. One hundred fifty-six branches have shown negative growth in deposits, while

Table 6. VN Bank ranking in 2003-2004 in 27 nationalized banks

Criterion.	Ranking.
Strength and Soundness	25
Growth 1	8
Profitability	22
Efficiency 1	9
Credit Quality 2	5
Overall Ranking	25

390 branches have registered deposit growth rate of less than 10%. As many as 489 branches have shown negative growth in advances, while 276 branches could achieve a growth rate of below 10%. The continuous reduction in the market share is a serious threat to the existence of the bank. Compared with the peer group banks in business, VN's growth has been below average. Most of the IT adoption in the bank to date is driven by the requirements of high-volume transaction processing, but now the bank needs to focus on the strategic use of IT.

With fund-based income coming under stress (as margins on traditional banking business have declined due to lower interest rate on loan and advances), banks are now looking toward non-fund-based business. This is an important phenomenon in the Indian banking industry. In the future, if PSB want to earn profits, it has to focus on segmenting the customer, customer acquisition, cross selling, income from fee-based services, and creating value service. In metro and urban areas, private and foreign banks have given PSBs tough competition. But some PSBs, like SBI, PNB, and Corporation Bank, also are providing tough competition to the private banks in urban areas. They have incorporated all the latest technologies in their systems and are trying to provide the same service level to the customers. Other PSBs are in line, and by 2007, they also will have the same infrastructure. Dr. Srikant, professor of strategy at Management Development Institute, Gurgaon stated:

It is true that by 2007, PSB will be able to achieve the same level of infrastructure and will be able to provide the same services as private banks, but private banks will always have first-mover advantage in metro and urban areas. One of the strength of PSB, which they are not exploiting, is their branch network and credibility in rural India, where private banks have not entered too much. Rural India is also getting importance from government, and many corporates are now moving there, as it is an untapped huge market (about 650 million). There are ample opportunities for banks in rural India due to the following reasons. First, the services sector is getting increasing importance in the rural areas also — from coffee shops to cable television operators. Assessing and meeting of credit needs of this sector is important. Second, the integration between rural and urban areas has increased significantly, with the results of mobility of labor, capital, products, and even credit between the two increasing. Third, commercialization of agriculture, particularly the increasing role of cash crops like cotton, has resulted in a substantial role for suppliers' and buyers' credit. Fourth, compared to cereal production, other food items, including poultry and fish, are growing at a faster pace. Rural agriculture is getting increasingly diversified in terms of products and processes. Fifth, in areas where commercialization of agriculture has reached significant levels, the traditional landlord-based tenancy is replaced with commercial-based tenancy. However, the *present credit and banking procedures do not cater to the working capital needs of such commercial-based tenancy relationship.*

SBI has come up with State Bank Institute of Rural Development (SBIRD) with the primary objective to bring about proper orientation among the operating bankers toward agriculture and rural development. The programs in the institute are designed to bring out a balance of inputs covering behavioral aspects of rural sociology and are fine-tuned for proper integration with technology. The Institute imparts training in micro-enterprises pertaining to small and village industries. It also enhances knowledge about emerging new credit delivery systems such as Self Help Groups (SHGs), which have the potential for effectively covering relatively less privileged masses among rural populations. Equal emphasis also is given on covering technology transformation relating to high-tech agriculture such as floriculture, aquaculture, and tissue culture, and are made part and parcel of the overall training system. Now, the time has come to move to integrated point of sale terminals to be provided in various places with one person for each terminal to operate. The point-of-sale terminal can be integrated to provide banking, insurance, e-governance, and other information services related to marketing and so forth at a single place.

Regarding opportunities for banks in rural India, Dr. Gupta, professor of Information Management at Institute on Rural Management, Gujarat, mentioned"

The branch network of PSB banks in rural India is very strong; they can earn a huge profit, if they exploit it properly. Besides providing basic banking service, they can provide services like land revenue collection, request for issuance of caste certificate, birth/death certificates/registration, and nativity certificate. If the bank starts providing these services, then people need not go to faroff places and spend time getting these services, and banks can charge for it. Other information services that banks can provide are market price information for purchase of input and selling output, access to details such as where the market is located, which commodities are sold or purchased in that market, what is the latest price, in which market prices are good, and so forth. Information on production and price forecast for selling or holding decision. Whether the agricultural production this year is more or less than the average. Forecast for Price movement, whether it will increase or decrease. When to sell. There can be many services which the bank can provide (e.g., weather forecast, knowledge about latest developments such as hybrid seeds, fertilizers and pesticides, telling farmers better farming techniques followed worldwide); other information can be to tell about farmers about crop rotation, mixed crops, and so forth. Self-employed persons can upgrade their knowledge from Web portals. Contacting doctors through the Internet and getting telemedicine is popular in Western *countries. Such concepts are yet to catch up in India. If any PSB is able to do half of the things which I have mentioned, it can earn huge sustainable profit. For this, banks need proper support of technology.*

ATM acquisition has become a large source of income for some of the banks. This means that revenue streams are now arriving in the form of customers and credit card holders of other banks that use these banks' ATMs. ATMs are the most successful delivery channel, followed by telephone banking and Internet banking. But the biggest potential could lie in mobile banking. With cell phone tariffs falling and increased bandwidth, the potential for a banking player to tap this channel is enormous. The number of cell phones was 35.87 million in May 2004 and is expected to rise to 100 million by the end of 2005. The future delivery channel will have various mobile portals using technologies such as GPRS. The customer would prefer to do banking transactions not only anytime, anywhere, but also through any device. With the current rate of evolution in the wireless industry, the mobile channel is poised to become the de facto banking channel within the next three years.

Another important factor for consideration in the evolution of delivery channels is the requirement of a multi-channel architecture that should support all future delivery channels, while also seamlessly integrating with existing delivery channels. This is the reason the majority of banks still have not launched Internet banking as a feature, as most of them do not have back-end integration. Effectively, this means that if a person holding an account with the bank wants to apply for a loan, he or she would have to enter the same details already disclosed earlier to the bank. This is where players like HDFC Bank, Citibank, or ICICI Bank hold an edge, as they have an end-to-end integrated system already in place. This gives them the ability to cross-sell their products based on the customer profile they have with them.

Mulligan and Gordon (2002) said:

Evolving customer expectations are also impacting e-business strategies. Customers now demand access to real-time data and expect this access to be available at anytime, anyplace, and via any means that the customer may choose. Financial transactions are now being executed on customer terms, not industry or individual company terms. Customers are also more technically and financially savvy, which motivates them to self-manage their investments. The desire to self-manage requires the firms to make market and analytical data available to customers — data that was formerly only available to internal financial analysts.

Rajeev Sharma, CMD, VN Bank is concerned about how to uplift the bank's image in this changed business scenario. The urban market is extremely demanding, and the rural market is poor in infrastructure. The bank has a problem competing with big banks like SBI, ICICI, and so forth, whose branches are present all over the country, while 70% of VN Bank's branches are located in the southern part of the country (Tamil Nadu and Kerela). Top management of the VN Bank has realized that the problem that they are facing today is the result of their more than required cost benefit analysis. Top management has to decide more on how to proceed. Nidumolu and Goodman (1996) have mentioned that top management plays a key role in deciding the thrust and direction of IT adoption in public sector organizations, because the planning and decision structure with respect to implementation of changes is usually centralized. Top management should realize the importance of branch managers and should impart to them proper training and support for the information they require in this dynamic information. There is evidence that middle managers play a very critical role in driving IT implementation and use in public sector organizations (Caudle et al., 1991). This is because these organizations are usually large, with multiple levels of decision hierarchy, and it is not possible for top management to oversee the details of the implementation processes.

Today, most banks are offering facilities like mobile banking, stock trading, Internet banking, multi-city cheque facility, any branch banking, bill pay services, telebanking, kiosk, and online money transfer from foreign countries. In VNs, only 70% of the branches are computerized. The bank's intranet is limited to some of the branches. Neither bank has its proper fast communication channel. VN has to do a lot, as the bank knows that if it does not take any strong step now, it will lose most of the profitable customers (it has already lost some of them). In order to offer more customized services to the customers, private and foreign banks are now focusing on business intelligence.

Karmarkar (2004) pointed out:

To survive the revolution, service firms of all stripes must start defending themselves, just as their manufacturing cousins did a generation ago, by putting themselves through competitiveness boot camp. The work ahead will require proactive, far-reaching, often draconian changes, focusing on customer preference, quality, and technological interfaces. Specifically, companies will need to rewire their strategies to find new value from existing and unfamiliar sources, deintegrate and radically reassemble their operational processes, and restructure the organization to accommodate new kinds of work and needed skills.

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APPENDIX I

A Brief History of Banking in India

Year	Banking Developments
1786	The General Bank of India, first Joint Stock Bank, was established. Following were the Bank of Hindustan and the Bengal Bank.
First half of the 19th century	East India Company established three banks: the Bank of Bengal in 1809, the Bank of Bombay in 1840, and the Bank of Madras in 1843. These three banks were amalgamated in 1920, and a new bank, the Imperial Bank of India, was established on January 27, 1921.
1935	The Reserve Bank, which is the Central Bank, was created.
1955	The undertaking of the Imperial Bank of India was taken over by the newly constituted State Bank of India (SBI).
On July 19, 1969	Fourteen major banks of the country were nationalized. Nationalization was done on the ground that the commercial banking system did not play its proper role in the planned development of the nation. It was believed that banks are controlled by a coterie of industrialists and business magnates who had used public funds to build up private industrial empires. Small industrial and business groups continuously and consistently were ignored and starved of funds, even though the government policy was to encourage small tiny and cottage and village industries. After nationalization, the concept of banking has widened from mere acceptance of deposits and loaning of funds to Development Oriented Banking. Banks increasingly are catering to the needs of industrial and agricultural sectors. From short-term financing, banks have been shifting gradually to medium and even long-term lending. From well-established large business and industrial houses, banks are positively assisting small and weak industrial units, small farmers, artisans, and other neglected groups in the country.
April 1972	The government of India also introduced the scheme of differential interest rates. Under the scheme, the PSBs will give loans at a concessional rate of 4% to the weaker section of the community, who have no tangible security to offer but who can improve their economic condition through financial assistance of from PSBs.
February 1988	Commercial banks have adopted the Service Area Approach under which a semi-urban and rural branch of a commercial bank was assigned a specific area comprising a cluster of villages and adopting a planned approach for its economics growth. Soon after nationalization, the commercial banks were asked to pay special attention to the financing of the priority sector of agriculture, small-scale industry, small business, and small transport operators. In the course of time, other priority sectors also were added, such as retail trade, professional and self-employed persons, education, housing loans for weaker sections, and consumption loans (refer to Appendix IV for Branch Extension of all Commercial Banks).
1991	Reform was done by the government based on the Narasimham Committee report. In this, banks were given more freedom, private sector banks were allowed to raise capital contribution from foreign institutional investors up to 20%, from Non-Resident Indians (NRI) up to 40%, the capital adequacy norms were fixed at 8% by Reserve Bank of India (RBI) in April 1992 (refer to Appendix V for Net Profits of Commercial Banks).

APPENDIX II

VN Bank Branches Statewise

States	Number of Branches
Andhra Pradesh	94
Assam	2
Bihar	26
Chattisgrah	24
Delhi	32
Gujrat	40
Goa	17
Haryana	10
Jarkhand	12
Kerala	260
Karnataka	112
Jammu and Kashmir	4
Madhya Pradesh	41
Maharashtra	33
Orissa	18
Punjab	22
Rajasthan	20
Tamil Nadu	491
Uttar Pradesh	60
Uttaranchal	5
West Bengal	15

APPENDIX III

Initiatives Taken for Rural India

Provision of Urban Amenities in Rural Areas (PURA)

Excess dependence of rural people on urban centers for purchase of inputs and marketing their output will be reduced. Honorable president of India Dr. A.P.J. Abdul Kalam Azad has placed an important thought before the nation for bridging the rural-urban divide and achieving balanced socioeconomic development. It is called PURA—Provision of Urban Amenities in Rural Areas. It involves identification of rural clusters with growth potential and creating four types of connectivity to them: (1) road, transportation, and power connectivity; (2) electronic connectivity in the form of reliable telecom, Internet, and IT services; (3) knowledge connectivity in

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APPENDIX III (CONT.)

the form of good educational and training institutions; and (4) market connectivity that would enable farmers and others to get the best process for their produce. The government has decided to implement the PURA strategy in 5,000 rural clusters across the country in the next five years. Priority will be given to Northeastern States, other special category states, and backward areas identified by the planning commission and other agencies. Transaction/Intermediary cost will be less, resulting in better margin. This will help the rural population to have diversified occupations, better income, and a decent lifestyle. Migration toward existing urban centers will be reduced, and the population pressure on urban centers will be reduced. IT-related infrastructure hubs will be developed in centers similar to the development of IT parks in urban centers, where all types of technical services will be made available to surrounding villages within a specific radius. Hardware and software services, communication towers, and communication services should be made available in those centers.

ITC "E-Choupal" Initiative

http://www.itcportal.com/ruraldevp_philosophy/echoupal.htm

The immense potential of Indian agriculture is waiting to be unleashed. The endemic constraints that shackle this sector are well known — fragmented farms, weak infrastructure, numerous intermediaries, excessive dependence on the monsoon, variations between different agroclimatic zones, among many others. These pose their own challenges to improving productivity of land and quality of crops. The unfortunate result is inconsistent quality and uncompetitive prices, making it difficult for the farmer to sell produce in the world market.

ITC's trailblazing answer to these problems is the e-choupal initiative; the single-largest information technology-based intervention by a corporate entity in rural India, transforming the Indian farmer into a progressive knowledge-seeking netizen (leader) and enriching the farmer with knowledge and elevating him to a new order of empowerment.

E-choupal delivers real-time information and customized knowledge to improve the farmer's decision-making ability, thereby better aligning farm output to market demands and securing better quality, productivity, and improved price discovery. The model helps to aggregate demand in the nature of a virtual producer's co-operative, and in the process facilitating access to higher quality farm inputs at lower costs for the farmer. The e-choupal initiative also creates a direct marketing channel, eliminating wasteful intermediation and multiple handling, thus reducing

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APPENDIX III (CONT.)

transaction costs and making logistics efficient. The e-choupal project is already benefiting over 3.1 million farmers. Over the next decade, the e-choupal network will cover more than 100,000 villages, representing 1/6th of rural India, and will create more than 10 million e-farmers.

Hewlett Packard (HP) "E-Inclusion" Initiative

E-inclusion is the vision of a future for Hewlett Packard in which all people have access to the social and economic opportunities and can use technology as a means to learn, work, and thrive by forging new kinds of partnerships with private and public entities in order to close the gap between technology-empowered and technology-excluded communities. A three-year alliance between Hewlett-Packard and the state of Andhra Pradesh will build an HP i-community with 320,000 people in four rural villages in Kuppam in the state of Andhra Pradesh on a pilot basis for educational, agricultural, healthcare, and telecommunications projects. It is a concept in which information and communications technology will be deployed strategically to help to improve job creation; income opportunity; and access to government, education, and healthcare services.

Other Initiatives in Rural Areas

There is ample evidence to show that new initiatives in rural areas are possible, successful, and profitable.

- State Bank of India (SBI) is proactive in developing and spreading the self-help group (SHG) concept in the country and bringing out innovative products like Kisan Credit Card and Artisan Credit Card. Now, the SHG concept is a grand success, and the recovery rate is about 98%. Women empowerment has been achieved.
- Wipro has announced that it will bring out computers at cheaper rates with inbuilt UPS with two hours backup specifically to serve rural India.
- Infosys has set up a foundation where 1% of the company's profit is utilized for social welfare activities.
- Tata Consultancy Services (TCS) has been providing free or subsidized equipment to educational institutions and charitable organizations. In 2001, its consultants developed ChildNET, a software solution for Childline, a non-governmental organization that helps children in distress.

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APPENDIX III (CONT.)

- Many milk cooperative societies (collecting milk from rural areas) have computerized their operations. Measurement of quantity of milk is supplied and the percentage of fat content is calculated through computers and then recorded there. Rates are calculated according to fat content in the milk. At the month end, bill settlement is done through computerized accounting. Receivable management is also done through computers. There are some cooling centers that use computers to maintain appropriate temperatures.

APPENDIX IV

Branch Extension of All Commercial Banks

As.on.June.30	.Total.No..of. Branches.	Rural.Branches	.R ural.Branches. as.a.Percentage.of. Total.	Population.per. Bank.Office.
1969	8,260	1,860	2 2	63,800
1991	60,650	32,750	5 4	14,450
2001	65,930	32,570	4 9	15,000

APPENDIX V

Net Profits ($ Millions) of Commercial Banks

Reporting.Banks.	1991-1992.	1992-1993.	1993-1994.	1995-1996.	2000-2001.
State Bank Group	54.22	62.22	79.11	176.22	493.78
Public Sector Banks	124.22	(810.67)	(1,062.00)	(257.78)	465.56
Private Sector Banks	17.11	13.33	33.11	123.78	258.22
Foreign Banks	71.11	(187.11)	127.33	166.44	210.00

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Chapter XIX
Developing a Telecommunication Operation Support Systems (OSS): The Impact of a Change in Network Technology

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Executive Summary

The Telecommunications Act of 1996 opened competition in the telecommunications market in the U.S. and forced the incumbent telecommunications companies to open both their physical and logical infrastructure for Competitive Local Exchange Carriers (CLECs). In this case study we focus on the problems that face a CLEC with regard to designing an information system and getting a back office system, called an Operations Support Systems (OSS), operational in a highly competitive, complex, fast-paced market in a compressed time frame when a change in a critical telecommunications network component, namely the central office switch, is made after 75% of the system implementation was completed. This case deals with the factors that led to this change in central office switches, its impact on the IT department,

its impact on the company, and the alternatives considered by the IT department as possible solutions to the many problems created by this change.

ORGANIZATIONAL BACKGROUND

Starting in the 1970s, there have been many deregulation efforts in many sectors of the U.S. economy as well as internationally. The basic objectives have been to increase competition, improve service, and lower prices (Perez, 1994).

In the telecommunications sector, an abundance of new firms have emerged since the Telecommunications Act of 1996, both to provide new services such as data networks and wireless, but also to compete with established wire line telephone services. While deregulation opened the telecommunications sector for competition in these areas, many of the new services were made possible by the advent of new technologies: wireless services, broadband on a twisted wire pair (DSL), optical fiber, digital switchboards, the Internet and the Web standards. In many cases, the new entrants (CLECS) were the first to apply these newer technologies.

In the telecommunications sector, the Telecommunications Act of 1996 opened up competition for local voice and data services. The incumbents in the U.S., the Regional Bell Operating Companies (RBOC) called Incumbent Local Exchange Carriers (ILECs), were forced to lease infrastructure to the new entrants, namely, Competitive Local Exchange Carriers (CLECs). Many CLECs managed to get their business and associated networks installed and running in a remarkably short period of time. However, as Martin F. McDermott discusses in his book *CLEC* (McDermott, 2002), problems occurred primarily in other areas. One area that caused major problems was operations support systems (OSS) and its associated provisioning and billing related functions.

Thus, by 1999, there were political rulings, court rulings, and FCC orders that laid a foundation for competition in the local exchange (CLEC) telecommunications sector in the U.S. This was a go-ahead signal for many new companies. By 2000, there were more than 700 CLECs. Some of these were sales only companies (Total Resale) and owned no infrastructure but used the ILEC infrastructure to sell telecommunications services using different market plans and lower prices since the ILECS had to sell services to the CLECS at a discounted (wholesale) price. Other CLECs were facility based and developed a network and switching infrastructure; in many cases using new types of equipment and technologies. For example, they used DSL (digital subscriber line) to provide both data and phone services on the standard local loop (2-wire pair).

Broadstreet Communications, Inc., an entrant into the facilities based CLEC arena in February, 2000, was formed by eight individuals who had experience working for ILECS, CLECS, cable companies, or teaching and consulting for the telecommunications industry. The founders determined that there was a reasonable market for combined voice and data services for small and medium sized businesses over broadband facilities using DSL technology and formulated a business plan based on this technology as a foundation for the company. Small and medium sized businesses were defined as having between 1 and 100 employees. Based on the business plan, the founders were able to acquire 62 million dollars in venture capital from 3 different venture capitalist companies. In addition, Lucent Technologies provided $120 million dollars in financing for a total of $182 million dollars of available capital. The company was headquartered in an industrial park about 30 miles southeast of Pittsburgh, Pennsylvania and established its service area as the mid-Atlantic states of Pennsylvania, Maryland, and Virginia, as well as Washington, DC.

A major part of the business plan was the utilization of information technology to contain costs and provide a high level of service to internal users as well as customers. This was the ultimate goal of the information system design but with the need to remain within the boundaries of the business plan. The difficulties of building an information system that would integrate all aspects of the highly complex telecommunications industry are well known but the task becomes even more difficult when, after 9 months of system development on a 12 month completion schedule, a major change is made in the most critical component of the telecommunications network, namely the central office switch. The impact of this change in network components is the focus of this case study and includes the technological, organizational, managerial, industry, and economic issues that all interact in making system design decisions when a major change occurs in the environment that impacts many of the originally envisioned system requirements. This includes issues related to hardware, system software, application software, networking, scalability, reliability, buy vs. make decisions, requirements engineering, Flow through Provisioning, interfaces with the public telephone network (PSTN), reciprocal relationships with other telephone companies, and the difficulties associated with adopting new packet switched technologies for voice.

Products/Services Provided

Broadstreet Communications, Inc. was a telecommunications company offering voice and data services to small and medium sized businesses employing packet switched, broadband, digital subscriber line (DSL) technologies. This technology offered significant cost and service advantages over the traditional analog loops and leased lines traditionally used to provide voice and data services to a customer's premise.

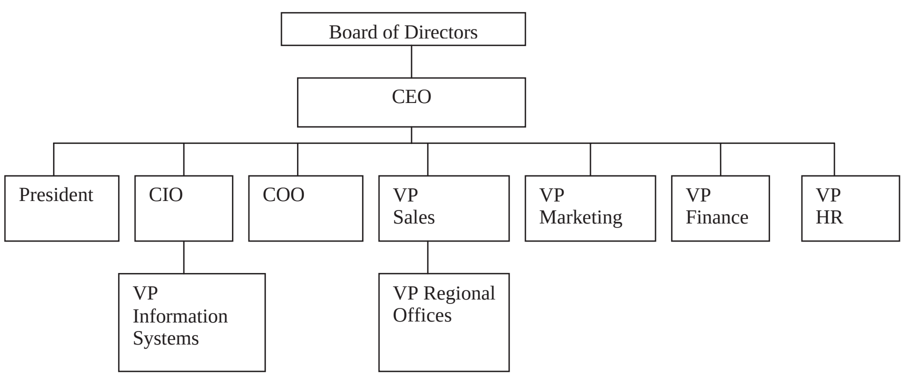
BroadStreet provided an integrated suite of business communications services including high-speed data, local and long distance voice, voice messaging, e-mail, Internet, as well as Web and application hosting. Through the development of a next generation network, BroadStreet was among the first service providers to deliver voice and data solutions over an Internet Protocol (IP) network, and leverage digital subscriber line (DSL) technologies for last mile connectivity to customers. Local and long distance voice services included all the services provided by a commercial central office switch such as caller ID, call forwarding, conference calling, voice messaging, E911, 800 numbers, and so forth. Data services included Local Area Network (LAN) services, Internet access, e-mail, Web site hosting, and application hosting.

Management Structure

Broadstreet Communications had a fairly flat but hierarchical organizational structure as shown in Figure 1.

The board of directors was composed of representatives from the Venture Capitalist groups (3) and 2 members of Broadstreet Communications, namely, the CEO and president, plus one outside members agreed upon by those members. The CEO was also the Chairman of the Board of Directors. The two anomalies in the structure were that the CIO and the VP of Sales had junior VPs for information systems and regional sales offices based on the demands of the individuals who fulfilled those roles.

Figure 1.



Financial Status

At startup, Broadstreet Communications had $62 million dollars of venture capital from three different venture capital firms and $120 million dollars of financing from Lucent Technologies. The original business plan called for Broadstreet to begin delivering services and realizing revenue after one year of development. But, it took Broadstreet approximately 18 months to become fully operational and during that time it operated on the venture capital and finance funding provided with no revenue from products or services. After 18 months of developing an infrastructure of personnel, sales offices, networks, and information systems; Broadstreet began to offer products and services to small and medium sized business customers. This began in the Pittsburgh, Pennsylvania area and then expanded to Baltimore, Maryland; Washington, DC; Richmond, Virginia; and Norfolk, Virginia. Within 7 months of offering services to customers, Broadstreet had approximately 1,400 customers with revenues of slightly over $1 million per month. Broadstreet was growing at approximately 20% per month. Based on covenants agreed to between Lucent Technologies and Broadstreet, as well as operating costs, the company needed to have revenues of approximately $2 million per month to cover costs. It was quite clear that had Broadstreet started offering services and realizing revenue 4 to 6 months earlier, the finance covenants and operating costs could have been met. Had the Back-office OSS system been operational 4 to 6 months earlier, Broadstreet would have survived the economic downturn that began in 2000, but the delay caused by the introduction of a new central office switch did not make this possible. It was late in 2001 when the “dot com” bust and the telecom sector’s severe downturn caused Lucent Technologies to terminate the financing agreement based on the covenants, and one of the venture capitalist that suffered large losses in the “dot com” bust also decided to terminate their investment. This made operating impossible due the lack of resources and Broadstreet made a decision to close the business after approximately 2 ½ years. At that point in time Broadstreet had over 180 employees as well as a number of subcontractors who were dependent upon BroadStreet for their livelihood.

Strategic Planning

In early 1999, the VP of operations for Adelphia Business Solutions decided that the Telecom Act of 1996, the advent of DSL technologies, and the telecommunications needs of small and medium sized businesses made the telecommunications market an attractive investment with large revenue opportunities (New Paradigm Resources Group, Inc., 2002). He contacted individuals who had special expertise in the areas of telecommunications technologies and networking, sales, marketing, finance and accounting, human resources, and information systems and technologies (IT). He asked the IT expert to gather data related to potential customers in major cities along the east coast of the U.S. as well as data on ILECS and other CLECs serving the same region. This data was used to determine the potential revenue for offering telecommunications services. At a meeting convened by this individual, all of the recruited individuals expressed an interest in leaving their current positions and forming a startup company to offer voice and data services over DSL to small and medium sized businesses

Each individual in this group was assigned the task of documenting a plan for getting their area of responsibility operational. This included the activities that needed to be accomplished, the schedule for completing the activities, the resources required to become operational, the cost of operating, and policies and procedures that would be followed in their area of responsibility. The marketing individual was tasked with defining the products and services, market service areas, the expected number of customers, and the estimated revenue. The individual in charge of sales was tasked with determining where sales offices would be located, the staffing required for each office, the sales methods to be used, and the policies and procedures from the time a sales order was acquired, to provisioning the service, to billing, and finally to customer follow-up. The telecommunications technology expert was tasked with determining what technologies would be used to offer the DSL service and interface with the Public Switched Telephone Network, how these technologies would be networked together, how the network would be monitored and controlled, how the products and services would be provisioned after a sale, and how repairs would be made when an outage occurred. The Human Resources expert was charged with determining the policies and procedures for managing the personnel issues related to hiring, termination, benefits, payroll, expense reimbursement, and work place safety and health issues. The finance and accounting expert was tasked with exploring sources of revenue including venture capitalists, bank loans, and other financing options, as well as establishing an accounting system with appropriate policies and procedures. The information systems expert was tasked with developing a plan for what information technologies were required to support and integrate all the other plans. This, of course, meant that the IT plan could not be fully formulated until all the other plans had been developed and required working closely with all the other groups to assess needs and offer advice as to what technologies could be used to support their areas. While others were getting started on their plans, the IT expert began to examine what operations support systems other CLECs and ILECS had either developed or acquired from software vendors. A major effort was to evaluate how competitors were offering converged local voice, long distance voice, data, and Internet services (Emre, 2001).

One of the strategic decisions made by the IT expert was to minimize the number of hardware, software, and network vendors involved and attempt to make sure that the interfaces between information system components were at the database level and minimize application program interfaces (APIs) at the program module level. This would provide flexibility in acquiring the best of breed or developing applications in-house, since the data needed by an application was available at the database level. Another strategic decision was to only use technologies that adhered to standards such as SQL compliant databases, TCP/IP protocols, telecommunications industry standard formats, and so forth. Outsourcing was also considered and rejected as an approach to getting the OSS functional, (Bhandari & Mania, 2005).

The decision to buy or build applications was decided by several factors:

1. The amount of time available to build an application that was known and controlled vs. the amount of time to install, configure, and learn a purchased application.
2. The level of knowledge required to build an application such as billing that was reliable and stable vs. the amount of time to install, configure, and learn how to control a purchased application.
3. The resources required to build, operate, and maintain an application vs. the resources required to purchase, install, configure, operate, and maintain a purchased application.
4. Whether the functional capabilities as determined by the organization could be fulfilled by a purchased application or whether the application needed to be built with desired customized features.

Organizational Culture

The organization had a culture where micro-management was typically not done and where individuals were valued for their capabilities and the results produced. Of course, there were exceptions. The CEO was a charismatic person who liked people but also valued hard work and honesty. He was a good motivational leader and knew all aspects of the telecommunications business better than anyone else in the organization. His charisma was demonstrated by getting personnel who were well established in their careers with established companies to take a career risk by resigning their position and joining a startup company. He also had the ability to boost employee morale when situations became difficult by giving highly motivational speeches and offering sound advice and additional resources where needed. The turnover in personnel was nearly zero. The CEO had many years of experience in the telecommunications business and had started two other telecommunications companies before joining Adelphia Cable's Business Solutions division after one of the companies he started was purchased by Adelphia Cable. Broadstreet had an executive committee that met on a weekly basis and made recommendations regarding resource allocations, policies and procedures, as well as business strategies.

The organization was driven by the sales and marketing people who were long-time friends of the CEO. This caused many IT decisions to be based on look and feel and resulted, in some cases, of selecting form over functionality. For example, the president spent over $400,000 on furniture and decorating the headquarters office so that customers would be impressed when they visited the company. Of course, this almost never happens with telephone companies. Another "form over functionality" decision that cost the IT department time and money was the president's decision to have the format of the customer bill changed so that it was more aesthetically pleasing since he viewed this as an important medium of communication from the company to the customer. Since the billing system was a purchased system, the vendor had to be contracted to make the changes. This took 60 days and $200,000. One other example of "form over functionality" was that the VP for marketing was determined to present the DSL technology model in sales presentations, service/product offerings, costing, and billing so as to impress the customers with this new broadband technology utilizing the standard telephone line. Nearly all the billing systems on the market had an underlying model of one line, one device (telephone, fax, PC) based on the old technology, and to make any of the billing systems accommodate the one line, multiple devices model of the DSL technology required either having the vendors modify their systems or finding work arounds in their models. This caused several months delay and nearly a million dollars in professional service charges from the billing system vendor.

Overall, the organizational environment was, on one hand, relaxed, but on the other hand, fast paced and highly stressful for task-oriented people like engineers and software developers. For example, it took over six months for marketing and sales to get the products and services defined and prices established which made order entry, flow through provisioning, and billing applications difficult to get underway by IT in a timely manner. Except for a few individuals, people cooperated with one another and strived to make the company a success. An example of the relaxed yet stressful nature of the company is that the entire headquarters staff frequently played softball on Friday afternoons but worked seven days a week, 12-16 hours a day. All employees were granted stock in the company and therefore had a vested interest in making the company successful.

Not all technology related decisions were made based on good technical criteria. For example, the central office switching technology initially selected by the Chief Technology Officer (CTO) was a new product from Lucent Technologies called a PathStar. This switch cost approximately 50% of the older, but proven, 5ESS switch used by other telephone companies. After nine months of struggling to get the PathStar switch to function correctly and reliably, Lucent decided to remove it as a central office replacement switch for the 5ESS due to lack of functionality, scalability, and reliability. After nine months, Broadstreet replaced the Pathstar switch with the 5ESS switch. The industry standard 5ESS switches were installed and functioning in approximately two months. This left Broadstreet's IT/IS department in the difficult position of having to completely reengineer, reconfigure, redesign, and rewrite software used to perform functions such as capturing call detail records for billing, controlling flow-through provisioning, performing network monitoring and control, as well as making changes to Order Entry, Sales Force Automation, inventory management, and other smaller applications.

Economic Climate

The economic climate going into 1999 appeared to be extremely good since the technology sector stocks were continuing to increase dramatically, and new technology based products and services in the e-commerce area were being created on an almost daily basis. Also, telecommunications was a critical component of nearly all the new technology products and services and was growing in demand. Thus, in 1999, it was relatively easy to get the venture capital and financing necessary to start a company, especially with the experience and charisma of the CEO and highly experienced management team. By the time all the financing agreements had been signed in early 2000, the "dot com" crisis was starting to become a reality and the telecommunications industry was a prime victim of the overvalued companies and stocks. By mid-2001, CLECS were going bankrupt at an alarming rate, but Broadstreet was gaining momentum in terms of acquiring customers and increasing revenue.

By mid-2001, the company had grown to more than 160 employees in six markets and Broadstreet had become more proficient in its internal processes and dealing with its external partners and customers. Things were looking very positive for the company, but Lucent Technologies stock was decreasing in value at an alarming rate, and one of the venture capitalist who had invested in several of the overvalued "dot com" companies had taken large losses and was under pressure to get out of the telecommunications sector. Almost simultaneously, Lucent Technologies and this venture capitalist announced that they were terminating their agreements. The other venture capitalists could not provide additional funding and refused several others who wanted to invest because these potential investors wanted too large a share of the company.

After nine months of design, development, and testing of the telecommunications network, OSS software, and other software systems, a decision was made to change the central office switch because the one initially selected could not be made to function adequately and lacked many features needed by potential customers. This became a major factor in the survival of the company. The change in central office switches caused a nine month delay as network and software system personnel reworked all systems to accommodate the new central switch with its added capabilities and features. This delay consumed financial resources without the benefit of planned income and forced Broadstreet to close its doors in late 2001 because it could not meet the finance covenant agreements with Lucent Technologies and the declining confidence the investors had in the telecommunications industry.

Setting the Stage

While the U.S. Federal Communications Commission (FCC) orders based on the Telecommunications Act of 1996 seemed reasonable enough from a CLEC's point of view, the implementation of these orders was not simple and straightforward. Telecommunications is an extremely complex business. On the plain old telephone network, customers expect to be able to pick up any phone, at any time, and call anybody, within the country or internationally, independent of which phone company they or the recipient uses. While the technical issues of this connection are most often handled by the central office switches and network routers of the incumbent telephone companies, the OSS system of the CLEC must at least handle the provisioning, 911 access, call detail record processing, network monitoring, controls, alarms, and repairs as well as billing. This is quite a complex matter as many different companies and an abundance of procedures, data exchanges, standards, service level agreements, and price policies are involved.

Billing is a critical and extremely complex part of the functionality that OSS systems must provide and CLECs must also have functionality in place for provisioning new customers (often customers that earlier were connected to an ILEC), or for de-provisioning, when they lose a customer to a competitor as well as monitoring and controlling telecommunications network components, switches, routers, circuits, and so forth. While deregulation has opened up competition, there are other regulations in place that must be followed. For example, all telephone provider companies must provide 911 (emergency) services. This includes the ability to tell the emergency facility where the caller is located. Other services, such as "caller ID" and "800 numbers" also involve the ability to access and update national databases. This would be an easy task if all the standards were in place and followed, but the standards are compromised by the incumbents and the CLEC must accommodate many different formats and processes.

To perform all these services, a CLEC needs reliable back office systems. In principle, these can be developed in-house, or be leased or bought from vendors. In practice, only the latter two alternatives are feasible if a CLEC wants to be operational in a very short period of time. One of the keys to the success of a telecommunications company that offers a range of narrow and broadband voice and data services is how effectively and efficiently the back office operations support system functions. This system has been defined as the set of hardware, software, procedures, policies, and personnel that support the following main activities:

- Network Design and Inventory
- Network Monitoring and Control
- Provisioning and Activation of Services
- Service Assurance
- Interconnection Management
- Customer Care & Billing
- Work and Workforce Management

One of the more obvious characteristics that stand out from the list presented above is the widely diverse but highly interrelated nature of these activities. But there are many details associated with of each of these functions and their relationships. Understanding the technology of telecommunications is one thing, understanding the *business* of telecommunications is quite another. Appendix A illustrates the technology architecture for DSL technology and Appendix B illustrates the business of telecommunications.

The "natural monopoly" of telecommunications, that is, the idea that there are advantages to having only one company, has been challenged (Perez, 1994), and the business complexity of having many companies "sharing" parts of a common infrastructure has perhaps not been fully understood.

New entrants into the telecommunications market see the potential for using new technologies to take customers from the incumbents and make huge profits. The number of CLECs that have failed show that most of those who are involved with these new companies do not understand the details of the business and consistently underestimate the cost, time, skill, and knowledge that it takes to offer and maintain a wide array of telecommunications services with an adequate Quality of Service and fulfill Service Level Agreements.

Case Description

In order to design, implement and operate an OSS, it is necessary to understand not only the technology of telecommunications and the technology of information systems, but the business of telecommunications as well. This includes understanding the requirements of every technology, function, service, and product involved and incorporating these requirements into every design, development, testing, and documentation decision. One of the critical components in a telecommunications network is the central office switch because it dictates the services and associated features that can be offered, how provisioning is done, how network monitoring and control is performed, the interconnection with the PSTN, and what data is collected about each call for rating and billing purposes. When a decision was made to change the type of central office switch after 75% of the OSS has been developed, tested, and documented, it caused a major disruption to the IT implementation plan. Broadstreet Communications experienced such an event 9 months into a 12 month IT implementation schedule which caused IT to develop a new plan to evaluate what information system and associated OSS components were impacted and what measures were necessary to change its acquired and in-house developed software to be compatible with the new central office switch and the new services and features provided by the new switch that sales and marketing now wanted to offer potential customers. The issue facing IT was how to recover from such a decision and still try to meet budgetary and schedule constraints imposed by management.

Technology Concerns

In attempting to recover from a change in a critical component in the telecommunications network that not only provides services to customers and interfaces with trading partners (ILECS) but also captures critical data for billing, network monitoring, network control, and provisioning, a complete halt in current system development occurred. All components in the OSS and related systems had to be evaluated to determine what, if any, impact the new switch would have. But, of course, this change in central office switches also caused marketing, sales, engineering, help desk, and so forth to all reexamine how their functions would be impacted. The following describes some of the areas of concern related to the change in central office switches.

When a CLEC acquires a customer from an incumbent (ILEC), an exchange of information between the incumbent's OSS and the competitor's OSS must take place to order facilities. The ordering process (Local Service Request [LSR] and Access Service Request [ASR]) requires knowledge of how the telephone business operates, the business rules used by the incumbent, and the special language used by the ILEC and the industry as a whole (Garifo, 2001). For instance, when ordering a local loop, you must know the CLLI (Common Language Location Identifier) code of the central office to which the customer will be connected (Telcordia Technologies, Inc., 2000). A new switch introduces new terminology as well as new port and jack labels which are critical for the ILEC to connect a local loop to the CLECs switch.

The ordering of Unbundled Network Elements (UNE's), their installation by the incumbent, the installation of equipment at the customer's premise, disconnecting the current incumbent's service, and the testing and activation of the new service must be scheduled and monitored carefully so as not to leave a customer without any service. For example, a telephone service must provide 911 capabilities. This requires a trunk from a telephone company's local central office to a 911 center (called a PSAP—Public Safety Answering Point) and this, in turn, requires that the telephone company maintain a database of addresses where telephone lines are terminated along with the telephone number associated with each line. Since telephone numbers can be "ported" (i.e., customers can take their telephone numbers with them when they move within a region), there is a national database that must be updated with this porting information. If a customer wants an 800 number (dial free), this also requires interactions with other vendors and updating a national database. Likewise, if caller ID is desired by the customer, this requires yet another national database be updated as well. A new switch changes the flow-through provisioning components of an OSS to accommodate these features.

If a calling card service is to be offered to customers, then an agreement with the Centralized Message Distribution Service (CMDS) must be established and Call Detail Records (CDR) or billing records must be exchanged on a timely basis. Since most customers want a long distance service, interconnection arrangements must be made with the long distance carriers and if convergent billing is offered, the ability to acquire and exchange CDRs with the inter-exchange carriers (IXC or long distance—LD) is a must. Likewise, the equal access regulation requires the exchange of CARE information (Customer Account Record Exchange) to notify the LD carriers when they are losing or gaining a customer. This provisioning of services is one of the most complex components for an OSS to accommodate (Jethi, 2005) and a new switch can change the procedures and data formats necessary for this provisioning.

Although there are data exchange standards for the format of these records, every vendor has its own interpretation or use of various fields within the record which causes back office systems to have many translation software packages for transforming call detail and billing records into a format that can be processed by their own OSS. A new switch can have a different format and data element interpretation that have to be accommodated.

When a service is sold to a customer, the network devices and associated logical attributes must be installed or allocated, interconnected, configured, activated, and tested. This is the service provisioning and activation process. Any specific attributes associated with these components must also be tracked, for example, data speed, and calling features. Tracking what has been allocated to a customer and being able to trace the path from the customer premise is critical to managing and maintaining the service. A new switch can differ considerably from the previous switch in terms of components, labels, functionality, and terminology.

One of the most complex aspects of an OSS is billing. It is complex because rating calls (determining the class of call and associated billing rate) accurately can be a logical nightmare because a caller can theoretically call from anywhere in the world to anywhere in the world at anytime. The second is that the United States has divided its geographical area into LATAs (Local Access Transport Areas) over which a call is considered a long distance call. Unfortunately, LATAs cross state boundaries which make determining the type of call more difficult. Then, there are the message unit charges for local calls that extend over certain distances (zones) from the caller's central office. A call may come from a ship at sea, an airplane, a hotel, a prison, a pay phone, an educational institution, and so forth, all of which are rated differently. The billing system must not only determine what type of call was made but also what plan a customer has and how the charge must be computed, for example, was it a week day or weekend day, after 9:00 pm, over 1,000 minutes of usage, and so forth? This data is derived from the Call Detail Records (CDRs) captured at the central office switch, and a new switch may differ significantly in terms of the data it captures about calls and the format of the data as well as the procedures needed to bring this data into a billing system.

In order to configure and activate services for a customer, local loops must be acquired and installed, devices such as switches, multiplexers, routers, and customer premise interface access devices must be configured by setting device parameters to meet the attributes of the services purchased; and databases must be updated for porting numbers, 800 numbers, caller ID, 911, and so forth. For example, a last mile DSL provider of voice and data may need to access and configure the following devices to activate the service for a customer:

1. Interface Access Device (IAD) at the customer premise
2. DSL Multiplexer at the Local Service Office
3. ATM Router at the Central Office
4. Internet Router at the Central Office
5. Switch at the Central Office
6. Internet server
7. VPN server
8. Voice Mail server

Entering any local telecommunications market is not a simple thing to do, and a change in the central office switch may cause unforeseen problems (The Competitive Telecommunications Association, 2005).

Technology Components

Many of the OSS components run on systems with clustering capabilities, a database management system, and application software written in a programming language such as C or C++. The system architecture is usually client server where the desktop client uses TCP/IP over an Ethernet network. The Server CPUs are networked for high availability and reliability with multiple network connections. The network disk storage is usually RAID 5 or higher to guarantee data integrity. The database is replicated to ensure a fault tolerant data environment. A hot backup or a cluster is used to guarantee continuous operation. A disaster recovery plan and associated resources are in place. The internal network has redundant paths between remote offices and the OSS system location as well as the disaster recovery location.

Much of the OSS software commercially available does not scale, is not reliable, and is not flexible which, in turn, can cause a new company to struggle with commercial OSS software. It is important to balance what services and functions the Back-office system will provide (Tombes, 2003).

The basic system design for Broadstreet's OSS is shown in the diagram in Figure 2. It is obvious that the OSS is comprised of many different DBMSs, software packages, hardware platforms, operating systems, and networking components. The introduction of a new switch has side effects on many of these components.

Scalability and Reliability

To be successful, a telecommunications company needs to acquire customers and lots of them. The capital, circuit, and labor cost for a telecommunications company is very high and therefore the need to utilize the available capacity to produce revenue is essential for survival. The OSS, like the customer service network, must be highly reliable. The OSS must be able to scale with the business and must be available at all times. The scaling can only be accomplished by using efficient application software, database management systems, operating systems, and hardware as well as adequate network bandwidth for users of the OSS.

Management

The management of such a diverse set of technology resources and the people who design, implement, operate and use them requires a formal set of policies and procedures such as strict change control and a team of talented individuals who are not only dedicated but loyal, motivated, and able to withstand high levels of stress. The difficult management issue related to personnel is that it is very rare to find all these traits in a single individual. The management approach at Broadstreet was to have

Figure 2. OSS software architecture

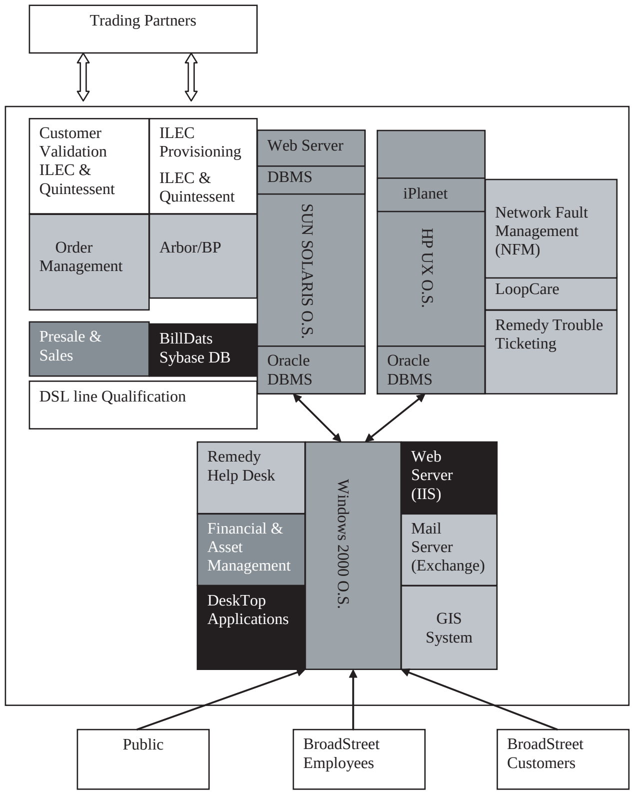
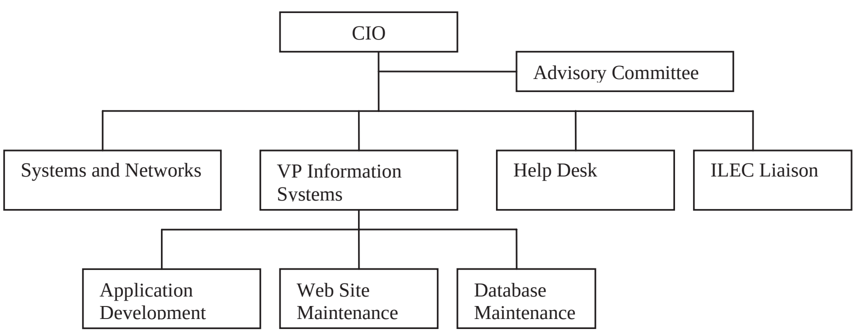


Figure 3.



a detailed model of the systems and processes needed to design, code, test, install, implement, and operate either purchased or developed software. The management challenge was to make sure everyone involved understood the technologies, the business model, the business rules, the technology models, the policies, procedures, and to implement systems within time and budget constraints. The IT department was organized around major functionality components as shown in Figure 3.

Advisory Committee

The advisory committee was composed of representatives from each of the major components of the organization such as sales, marketing, finance, provisioning, engineering, human resources, and so forth. This committee met once a week and was provided updates on progress, asked for advice on implementation and operational issues, and helped defined requirements for functionality, interfaces, and interrelationships. There was an attempt to use sound software engineering principles based on those in publications such as Thayer (2005).

The CIO was part of an executive management committee that met each week to discuss issues, schedules, plans, and resource allocation. The CIO expressed concern with many of the delays and mid-stream changes that marketing and sales advocated since it not only caused delays, consumed unplanned-for resources, and required reworking or acquiring new software, but it also caused morale issues among the IT and engineering staff who seemed to never get anything completed. Typically, the CTO and engineering were aligned with the CIO in objecting to requested changes or lack of specificity in requirements for new features, functionality, or services. The question typically posed by these concerned individuals was: Will this change significantly to improve the service or the revenue stream? The answer was usually, “we don’t know for sure but it will make us look good.” For example, marketing wanted to significantly change the Web site with more graphics and animation so they could compete for an award for the most attractive Web site. The CIO objected because it would take personnel resources away from more critical software development areas such as billing, provisioning, sales force automation, and so forth. The project was approved anyway. This was a typical pattern at the management meetings.

The fact that sales personnel did not have any customers to call on meant that they had plenty of time to think up interesting data analysis, data presentation, order entry, customer care, and product and service packaging schemes which impacted many parts of the back-office system. The software was under continual enhancement and revision, which made it difficult to complete software to meet the unmet functional requirements of the originally designed OSS and information systems.

Eventually, the CIO was only invited to management meetings where there were technical issues that needed his expertise, and requests for changes, enhancements, and additional functionality were sent to him via e-mail or paper documents. The CIO then implemented an on-line service request system that not only guided the requestor through a set of questions that detailed the requirements for the requested change or enhancement but also required schedule, cost, and benefit estimates. This quickly reduced the number of requests.

When it was announced, after nine months of system development, that the current PathStar central office switch was being replaced by the 5ESS switch, everything came to a halt, and the CIO was invited to all the management meetings once again because the central office switch impacted nearly everything. The CIO and CTO presented a plan for accommodating the new switch into the physical network and the software environment. The impact on the physical network was much less than the impact on the software since the 5ESS switch was not only a well known device but the network engineers were experienced in its installation, configuration, usage, and provisioning. That was not the case for the software engineers who now had to reexamine nine months of software development and software configurations for purchased packages. This also meant that the professional services personnel who had helped configure purchased software had to be called back.

Technology Resources and Constraints

The major constraints for overcoming the introduction of a new switch were time, budget, and finding highly competent personnel and consultants (professional service personnel) who had the interests of the organization's success as a priority rather than their own personal benefit. Budgetary constraints placed limits on hiring more high priced personnel, equipment with capacity for the future, and software packages to perform every needed function.

Every individual in the organization had either a laptop or desktop computer. All sales personnel had laptop computers and most management personnel had both a laptop and a desktop computer. Each of the six regional offices had two servers, namely, a primary and a backup, with a DS1 channel back to the headquarters in Pittsburgh. Headquarters had two servers for the billing, provisioning, and ILEC interface systems and two servers for network monitoring and diagnosis. There were also two systems running purchasing, accounting, human resources and other business functions, two systems running order entry, customer relations, marketing, helpdesk, inventory control, GIS, Web Site, and interfaces to the provisioning, order management, billing, trading partners (for ordering lines, 800 numbers, etc.), and 911 centers and one e-mail server. The servers were all connected via an Ethernet network using Ethernet switches as well as routers for the regional offices. The

Internet connection was a DS1 line connected via a router to the internal network and was available to every user.

The OSS and other application software was a combination of purchased packages and in-house developed packages. There were four different database management systems involved with the purchased software. The constraints associated with purchased software are simply those of control over how they function and the interfaces they provide. Some software systems provide configuration model parameters but once they are established and used to initialize the system, they cannot be easily changed. In many cases, the configuration must be done by professional services personnel from the provider since they provide little or no documentation on how to configure the software.

Since more full-time personnel could not be hired, the IT department had to approach the new switch problem using existing personnel, professional service personnel from the providers of the purchased software, and some contract programmers. The problem with contract programmers is that they typically have a long learning curve concerning the application's policies, procedures, and business rules. Professional service personnel also have some learning time about the particular configuration parameters used at an installation. Their services are also quite expensive and the budget for this new development was not extensive.

Organizational Concerns

The concerns that the organization had as the OSS was developed and put into operation were inadequate documentation, failure to follow standards, reliability, stability, configuration limitations, limited integration of components, and adequate functionality to provide flow-through provisioning. Of course, the integrity of data and the security aspects of the OSS were major concerns as well. Hiring experienced IT personnel in adequate numbers who had a wide range of skills was a primary concern. The most personnel IT ever had during the two and a half years of Broadstreet's existence was nine people serving over 180 personnel at six locations. This was due to budgetary constraints as well as the inability to find highly qualified, experienced, and motivated personnel.

With the introduction of a new switch, it was necessary to evaluate its impact on all the Back-office (OSS) software already developed as well as the physical network and determine what changes were necessary. It also was necessary to determine the impact on software not yet completely developed. This caused major concerns among everyone including Broadstreet personnel, the venture capitalists, and the financier, Lucent Technologies.

The major concerns revolved around resources and schedules. It was quite clear that the 12 months originally estimated in the business plan to start selling services to customers was never going to be met. The question was whether the resources that remained would be enough to allow Broadstreet to start realizing revenue, not only to meet its financial covenants, but to remain a viable company capable of meeting its operating cost obligations. It was estimated by the CTO and his network engineers that once the 5ESS switches were on-site it would take about 30-45 days to get them installed and configured and about 30-45 days before the 5ESS switches could be delivered to Broadstreet.

The software effort was estimated to take much longer than the switch installations since marketing and sales now had a much wider array of services than the PathStar switch offered, and they wanted to incorporate them into the products and services offered. Marketing and sales estimated it would take about 30 days to redesign their service and product packages. The CIO estimated it would take about 30-45 days to evaluate the impact the new switch had on existing purchased and developed software and another 10 days to evaluate the impact of the new switch on the redesign of software not yet developed. The CIO would then be in a position to provide a time and resources estimate for changing the existing software and completing the development of the unfinished software. Asked to give a ballpark estimate of time, the CIO estimated it would take another four to six months to complete the Back-office system if adequate resources were available.

Challenges/Problems Facing the Organization

The major challenge facing Broadstreet at the point when a new switch was introduced was the impact it had on operational functionality such as processing orders; provisioning customers; installing devices; configuring devices and software; testing devices and software; activating devices and software; collecting and processing call detail records; calculating and sending bills; monitoring and controlling the physical networks; answering help desk calls; paying personnel; paying taxes; paying for purchases; reconciling reciprocal billing with trading partners; distributing 911 address changes; acquiring 800 numbers; acquiring and managing telephone numbers; managing and distributing IP addresses; as well as acquiring, processing, and presenting sales and marketing data.

Another problem that became evident early in the development of the OSS was that the purchased software configured by the vendor's professional service personnel did not always work correctly because the model that the software was built around was not based on DSL technology where 1 line is used for multiple services, for example Voice and Data but was based on the typical 1 line 1 service model. This, of course, caused a number of last minute changes to make it work correctly. This, in turn, affected many other software packages that either used the data or that provided data feeds to such a package. The vendor, of course, recommended that more professional service personnel needed to be brought on board that had special, niche expertise needed to configure the system. The concern was whether the underlying models for the OSS components were configured incorrectly and were producing incorrect data and interfaces to other system components.

In evaluating the OSS purchased software it was discovered that the product/system documentation was poorly done, was incorrect in many instances, and outdated. Broadstreet had sent IT personnel to training classes on all the purchased software so that the IT personnel who attended the classes would be able to support, maintain, and change the configuration of the system. It was discovered that the training, for the most part, was superficial and introductory. In fact, the trainers, in some cases, were not technically trained but simply followed a lesson plan with canned examples that teach the students how to navigate menus and complete data fields for the simplest cases. The concern was that reliance on a vendor's professional service personnel was not only expensive but unreliable.

Since the OSS must interface with many external systems for exchanging Call Detail Records, 911 data, 800 numbers, porting numbers, SS7 services, and so forth, it was important that standards were followed so that data exchanges occurred flawlessly. It became evident during the evaluation for the new switch that participants in the industry compromise the standards to meet their legacy systems or for other unexplained reasons. The concern was whether billing data, customer data, 911 and other crucial data were being transferred correctly so as to avoid loss of service or liability issues.

The ability to account for every CDR in the billing process without losing potential revenue is critical. Billing is complex because all calls must be typed/classed and rated correctly and unfortunately there are hundreds of call types. The concern was whether or not call records for the new switch were formatted and data elements defined in the same way as the PathStar switch so that calls could be rated and billed correctly.

The new 5ESS switch had a much greater capacity than the PathStar switch. The OSS, like the customer service network, must be highly reliable. The OSS must be able to scale with the business and must be available at all times. The concern was whether or not the systems would scale with the capacity of the new switch.

The requirement for a Web site that allows marketing and sales to advertise products and services, provide customer care, take orders on-line, track the status of orders, track the status of installation, and allows human resources to provide information to employees and prospective employees was also a major initiative for the company. Marketing wanted changes to the Web site almost every other day to incorporate a great new marketing idea, which consumed valuable resources that were needed for more problem and operationally oriented functions. The concern was that the IT resources consumed by Marketing and Sales reduced the IT resources available for other aspects of the OSS that were in need of changes.

Hiring the right kind of IT personnel and enough of them was a major concern of the organization. Because of limited budget, there were not enough resources to hire another 5-10 personnel and because of the need to have personnel with multiple areas of expertise and with the appropriate experience, work ethic and motivation, it was difficult to find personnel to complete the needed work on the OSS.

Of course, the overwhelming challenge was to recover from the change in the central office switches so that Broadstreet could begin acquiring customers, realizing revenue, and meeting its covenants with its funding partners and financier.

Possible IT Options

The options identified by the IT department when a decision was made to replace all the central office switches with a different switch after 75% of the system had been developed and implemented were:

1. Make a case to management for keeping the existing central switches for a period of time and only installing the new switches in new central offices, thus preserving the back-office systems that had already been developed and would permit acquiring customers, offering services, and realizing income from the existing central offices while performing a redesign, reconfiguration, and rewrite of systems for the new switch which would not only be placed in new central offices but eventually replace the old switches
2. Evaluate the impact that the new switch would have on the existing back-office system and develop a new plan for retrofitting the back-office systems already developed by either:
    a. using only existing IT resources at Broadstreet
    b. using existing IT resources plus professional services from vendors
    c. using existing IT resources and vendor professional services personnel plus outsourcing work to a professional programming services company
    d. outsource the entire back-office application to an Application Service Provider (ASP) firm that supports DSL network technology and the new switch technology until the IT department can redesign, reconfigure, rewrite, and implement a back-office system
    e. partner with an ILEC or other CLEC who has a back-office system using the new switch (5ESS) (which nearly all of them have) while the IT department can redesign, reconfigure, rewrite, and implement a back-office system

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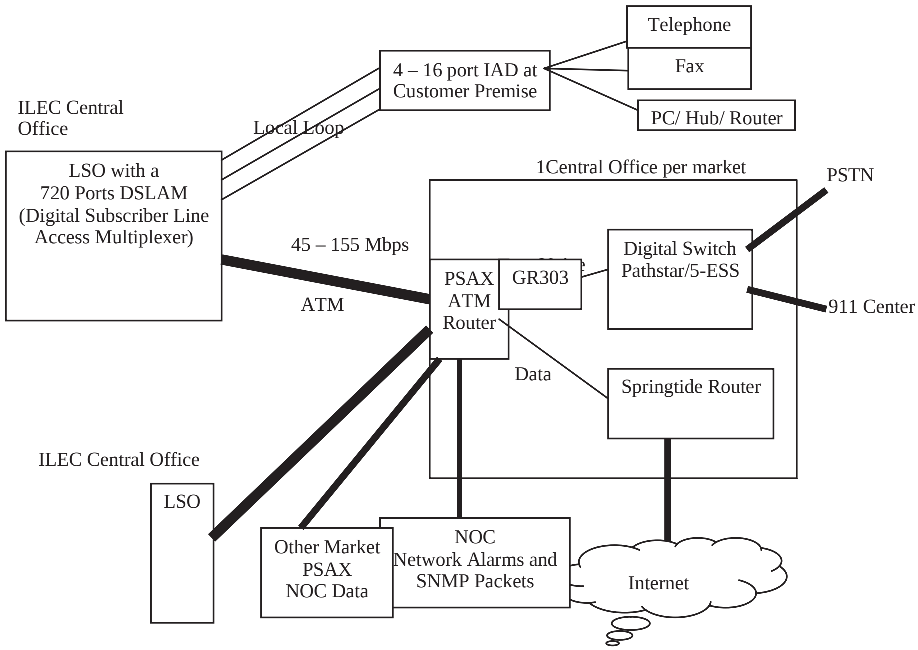
APPENDIX A. TECHNOLOGY ARCHITECTURE



Glossary of Terms

ATM—Asynchronous Transfer Mode: A high-speed small packet based method of transferring digital data between two digital devices such as a DSLAM and a router.

DSLAM—Digital Subscriber Line Access Multiplexer: a device that receives data from many devices over many telephone lines and transmits them in a sequential manner over a single high-speed communication line to another switching center for transfer the PSTN or Internet.

GR303—Generic Requirement-303: A Telcordia standard interface to a Class 5 telephone switch from a digital loop carrier such as DSL. This is the primary interface to the telecommunications central office switch from the outside world. In order to connect directly to the PSTN, IP phones and IP telephony gateways must adhere to GR-303.

IAD—Interface Access Device: connects the devices at the customer site to the telephone line by transforming the data when necessary to a form and format compatible with the DSLAM.

LSO—Local Serving Office: A switching center where local loops connect customer telephones, fax, PC, and so forth to the central office switch.

NOC—Network Operations Center: the place where all network components are monitored and troubleshooting of network malfunctions takes place.

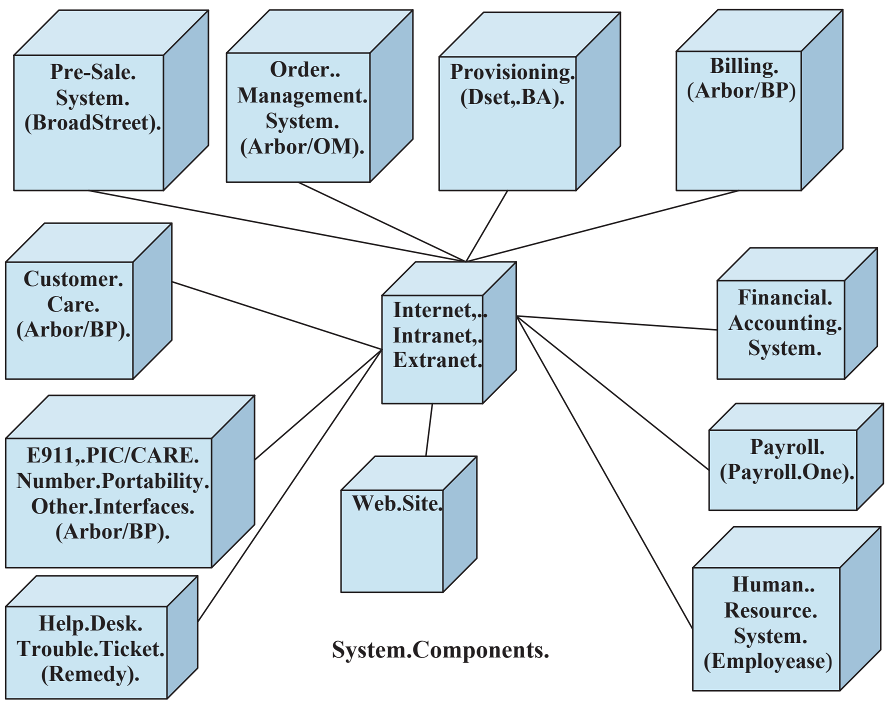
PSAX—PacketStar Access Concentrator: Acts as a concentrator and router for digital data using an incoming ATM format

PSTN—Public Switched Telephone Network: the Plain Old Telephone network that connects calls on a worldwide basis.

SNMP—Simple Network Management Protocol: The software standard used to detect network related errors and report them to the NOC.

Springtide.Router—A device used to route packets of data through an Internet Protocol network.

APPENDIX B



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Chapter XX
Nazar Foods Company: Business Process Redesign Under Supply Chain Management Context

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Executive Summary

Nazar Group of Companies has been a leading producer and distributor of cookies, crackers, cakes, chocolate, and other products in Turkey for more than 40 years. This case is about the group's management roles in transforming the companies into a more consumer-focused orientation using supply chain management philosophy as a strategic framework. Descriptions of supporting business systems were summarized along with the challenges and problems facing managers in effective utilization of these systems in practice.

ORGANIZATIONAL BACKGROUND

Nazar Cookies Company (NCC) was founded in 1961 by an entrepreneur who had seen a business opportunity in providing new cookie varieties for Turkish consumers. Having graduated from a European university with a management degree, he was expected to manage the family business of flour milling. After a short stay in his father's business, however, he decided to go on his own way with a clear vision of bringing new tastes to Turkish consumers at the highest possible quality. He also decided to establish his company in his hometown, which is a strategically located central Anatolian city that already had considerable industrial activity.

After a year of intensive work both in product and process development, NCC could begin production in 1962 with a capacity of three tons per day of a few varieties of products that already existed in the market. Since NCC was essentially a production-focused company, and since there had not been any other marketing companies to work with, the products were sold in bulk (4-5 kg boxes) to individual merchants at the factory door, who would then distribute them to retail shops in their own territories.

During the first few years, workers, foremen, engineers, and the owner were all working together very closely and with high motivation toward getting a share in the market, which was dominated by three major players, all of which were located in Istanbul, the heart of trade in Turkey. In addition to his quick learning ability, the owner/president was very successful in transferring a few critical people from competitors and bringing know-how through his European friends and their networks.

The company established the first semi-automatic production line in Turkey in 1967. NCC grew rapidly by the addition of new production lines and new brands. In 1971, NCC became a family-owned company under the trade name of Nazar Food Company (NFC). In 1975, together with its major competitor today, NFC successfully employed the packaging machines, which were able to produce individually wrapped portions in its process lines. This led these two companies to differentiate their products and earn strong consumer acceptance in the marketplace. Also, in the same year, management decided to lease a computer from IBM to handle personnel files and payroll, which marked itself in history as the first private organization using a computer in Turkey. In 1979, a machinery company (Nazar Machinery Company) was established in the city industrial zone to produce special bakery machines both for Nazar companies and others. Also, during that time, the accounting activities were fully computerized.

As NFC was about to become the market leader in 1980 with sales reaching 39,400 tons, the country experienced its strongest social unrest, which created unfortunate problems with worker unions. The operations had suffered for almost a year, during which the two companies faced grave financial problems. In 1981, the president decided to establish a new production company (Bonjuu Food Company) in the industrial zone and a new marketing company (Nazar Marketing Company) in the city, both with the minor partnership of a big industrial conglomerate.

Until 1990, the Nazar Group of Companies experienced stagnation. Computerization reached operational levels in each company. The marketing company organized wholesalers across the country and executed its sales operations through them. There were about 50 large wholesalers who sold Nazar products to more than 2,000 smaller local wholesalers, who also could procure directly from NFC. The transportation between the factories and wholesalers was outsourced.

In 1993, the president decided to establish a new and modern production facility for NFC in the industrial zone and to transfer the production in the old factory entirely to the new one in time. This new plant started production in 1995 with one highly automated production line. In 1997, the marketing company was moved to Istanbul, and the sales operations were reorganized under a new distribution system where individual and exclusive distributors were hired as business partners. Most of the old wholesalers became exclusive distributors of Nazar brand products.

Between 1990 and 2000, the business grew on the average of 5% every year, reaching about 74,000 tons annually (see Exhibit 1 in the Appendix). Until that time, export business had been given little attention. In 2000, however, the export directorship was formed within the marketing company, and exclusive distributorships were initiated in about 40 countries. In 2001, a new approach to production planning was implemented, which transformed then predominantly production-focused system into a sales-driven system.

The Nazar group management decided to enter into the chocolate business, and a new chocolate factory was built in 2003 in the industrial zone under NFC. By the end of that year, the marketing company sold about 111,000 tons of about 80 different Nazar brands, including cookies, crackers, digestives, light products, baby biscuits, specialties, cakes, pies, wafers, and breakfast cereals, out of which 21,000 tons were exports. The revenue exceeded $250 million US, while the group had almost no debt (see Exhibit 1). Nazar brand became one of the top five brands recognized in Turkey.

According to Nielsen data, between 2000 and 2003, the Turkish packaged bakery products market was stagnant. Since per capita consumption of packaged bakery products is about 3.8 kg in Turkey, which is well below developed countries (e.g., 7.2 kg in Germany, 11.4 kg in England, 14.2 kg in Holland), the reason for market stagnation was explained by the economic crisis that the country had been going through in recent years that adversely affected disposable incomes of the people (Euromonitor, 2003). Therefore, as economy improved in Turkey, the market was expected to grow considerably. This expectation had been luring most of the multinational companies and local industrial conglomerates to move into FMCG market through acquisitions, joint ventures, or direct investments.

In this market, from 2000 to 2003, Nazar's share rose from 29% to 33% (see Exhibit 1), while its major competitor's share declined from 59% to 50%. The rest of the market was filled by almost 50 small, mostly local producers, the largest of which had 5% share. The duopolistic market structure created by Nazar and its major competitor had been a big entry barrier for the newcomers. Both had established very strong brands and distribution patterns during the past 40 years. While Nazar's major competitor had been successfully moving into different food categories, from beverages to cooking oil, during the past few years, Nazar had chosen to remain focused at its core business until recently when it had moved into the chocolate business.

Nazar production companies currently operate under ISO 9002 quality standard leading towards TQM. This is in compliance with the group's objective of producing and selling the best quality products at affordable prices to Turkish consumers. In the late 1990s, NFC had turned down a joint venture deal with a giant multinational food corporation, closing the opportunity for higher competition in this market.

Among the distribution channels, the chain stores sales in Turkey had been rising from 19% in 2000 to about 40% in 2003, still far below developed countries, while the individual grocery stores' share dropped to 52% from 71% in terms of Nielsen's Retailer Measurement Index. The rest of the channel comprises confectionary stores, kiosks, gas stations, and so forth remain about the same. Nazar's distribution pattern altered similarly in that the share of national chain stores rose up to about 15% in 2003 in volume.

Nazar Marketing Company (NMKC) is the only customer of the two production companies and functions as a service (transportation, sales, marketing, etc.) provider for them. By design, these four companies cannot function independently in that together they form a big supply chain that is administered by the Group Management Team (see Exhibit 2 for the list of group managers.) Some of the members of this team have been elected for the Management Council, which the president established in 1999 (see the list of council members in Exhibit 3.) The council sets strategic directions and gives organizational and financial decisions regarding the group of companies.

All of the Group Management Team members are placed under the payroll of NFC. Also, NFC holds the industrial property rights of Nazar branded products. On the other hand, each company has a general manager who is responsible for its board, which is comprised of family members, professionals, and a few external consultants (see top levels of the organizational charts of NMKC and NFC in Exhibit 4.) Vice President of Procurement oversees the Procurement Director who manages a group of officers responsible for executing the MRP system through which the material requirements of the production companies are satisfied collectively. They communicate with the Supply Chain Group Manager and the factories' planning managers.

Vice President of Planning and IT oversees the Supply Chain Group Manager, the Information Systems Group Manager, and a number of technical analysts, and administers the Production Inventory Management System (PIMS), which is the key interface between sales and production functions. The Supply Chain Group Manager communicates with the procurement officers, Sales Forecast Manager, and country managers in the NMKC and planning managers in the production companies. The Information Systems Group Manager administers central data processing, the help desk for the Nazar intranet, and computer program development projects. The Vice President is also responsible for corporate governance and strategic planning, for which he or she establishes and coaches project groups to satisfy certain organizational needs.

The Technical Coordinator oversees the Quality Assurance Group Manager and a number of technical analysts and administers the use of technology and feasibility of investments in the production companies. The manager also coordinates group resources for process design, facility layout, Total Productive Maintenance projects, and quality assurance activities.

The NMKC has Marketing, Sales, Exports, and Planning directorships located at the head office in Istanbul, who report to the General Manager. NMKC has eight regional sales offices, each with sizable warehouses geographically dispersed across Turkey. Each office has a regional manager directly reporting to the Sales Director. There are about 150 distributors who execute exclusive sales routes. These distributors are individual merchants who serve about 180,000 sales points, including small kiosks, confectioneries, gas stations, groceries, and local chain stores. Each distributor is served by a Distribution Manager, who reports to the Regional Manager, who looks after daily local business affairs in addition to administration of financial and operational obligations of the distributors towards NMKC. Distributors own their service trucks, which are driven by their sales representatives who are trained and equipped according to the standards established by the Sales Director. Each sales representative carries a hand-held terminal through which they view the individual account of a sales point, issue an invoice, take backorders, or view promotion programs. The Sales Director designs and administers incentive packages for distributors, which include various operational and financial targets. If a distributor meets these criteria, he or she earns additional sales premiums.

The Marketing Director oversees a number of brand managers who are assigned to certain product groups. Brand managers administer standing of brands in the market, monitor competitors' activities, design promotion programs, develop brand advertisements, conduct consumer surveys, and contribute new product development projects. In addition, there is a Sales Forecast Manager under the Marketing Director who operates the Demand Forecasting and Production Order System (DFPOS) in collaboration with the Supply Chain Group Manager.

The Export Director and a number of country managers operate the Export Order Management System (EOMS) in collaboration with the Supply Chain Group Manager. The Planning Director of NMKC administers improvement projects as a project leader, which involves cost cutting, technology implementation, TQM, and other organizational issues. The Director also manages a local IT group, which acts as a help desk for the Distributor Management Information System (DMIS).

The General Managers in two production companies oversee Production, Technical, Planning, Quality Assurance, Finance, and Personnel Managers. The production companies are organized along the production processes, where each process has an owner who reports directly to all of the managers. Planning Managers operate PIMS in collaboration with the Supply Chain Group Manager.

SETTING THE STAGE

Prior to 1990, computer utilization had been limited to data processing for payroll and accounting purposes, which was administered under the Finance Coordinator. This involved a backroom operation lacking a clear vision or strategy. In 1990, Deniz Batu was hired as the Vice President responsible for planning and IT. His main task was to identify critical business processes and to develop IT applications to enhance and, if necessary, to redesign them according to a priority given for him at that time. Batu's concerns were on redesigning business processes using an IT-enabled approach to organizational change (Al-Mashare & Zairi, 2000; Davenport & Short, 1990; Davenport & Stoddard, 1994; Grover et al., 1993).

Until 1990, there had been an officer working under the General Manager of NFC who would communicate with NMKC through telephone, receive sales information, negotiate with them, and establish a production scheduling program for the following month. The manager would take into account capacity limitations, material, and workforce requirements based on some scheduling patterns coming from personal experience. Batu thought that this approach had been successful in the past when the system was compact enough, but then it eventually became too ad hoc and myopic, which did not allow structural business growth. He envisioned a new approach.

Batu decided to start from the business transactions of the wholesalers; that is, he formed a project group that developed an IS for order processing, credit status reporting, and payment collection. Shortly after the implementation of this system, the project group developed an additional IS module, which included warehouse inventory management and shipment operations.

Having collected sizable data through the use of this IS platform, Batu decided in 1992 to develop a performance measurement system that summarized financial and operational data as graphs and tables in order to support business decision making as well as to measure the performance of the marketing and production companies. This approach, however, changed the atmosphere of the group management meetings adversely, because until then the decision makers were used to relying on their instincts and limited information. The production people were more reluctant to accept the measurement results, while marketing people were disturbed mostly by someone else watching their operations.

One of the positive outcomes of the performance measurement system, however, was that the group management realized that the overall profitability of the group had been affected adversely by demand fluctuations. Thus, a lesser degree of demand variation would lead to less shortages, lower inventories, and higher capacity utilization. The group management started to search for remedies.

The friction between Batu and the rest of the group, however, did not stop him from proceeding. As a next step forward, he initiated another project group to work on sales forecasting. This group developed an IS module that generated monthly sales forecasts for each SKU based on the past 36 months' sales data. Users would input pricing and promotion information and choose among alternative analytical and subjective forecasting tools. As a result, the program would output forecast intervals (minimum and maximum values) for the following three months. Unfortunately, even though the users in NMKC liked the idea of forecasting, they were not willing to adapt for change. Thus, the use of this system failed in the implementation stage.

Batu's next target was to improve the procurement operation performance, measured as production loss due to material shortages. To this end, he decided to develop an MRP system for the Procurement Director and his team. He formed a project group that included production people and procurement officers. This group developed an MRP platform, which was essentially a decision support system to optimize total cost of procurement while improving the relationship between production planning and material availability. The system has been upgraded several times since its launch in 1995.

In about 1994, based on performance measurement results, the group management started to exercise the idea of implementing an exclusive distributorship instead of working with wholesalers. Even though the operational cost of a distributor system would be higher, it was believed that, among other benefits, this system would yield more accurate sales forecasts, which, in turn, would improve the overall performance of the Nazar group.

In 1996, the group management made its decision in favor of distributorship. Thus, Batu decided to develop an operation management system that would replace the existing system for the management of wholesalers. To this end, the Distributor Management Information System (DIMS) was developed and implemented in 1997. DMIS included order processing, inventory and account management, and promotion and pricing modules, which were presented as a decision support platform for the distributors. On the other end, the financial and operational performance of each distributor was monitored daily, since the system was synchronized by dial-up connections every night.

Together with DMIS, a newer version of the sales forecasting IS, called Demand Forecasting and Production Order System (DFPOS) was also launched. Being a monthly-operated, three-month planning horizon system, DFPOS was designed to administer production orders for Nazar production companies based on sales forecasts. In the first phase of the run, each Distribution Manager (64 individuals at that time) entered their subjective views as a function of 10 critical factors, including competitors' activities, new product launches, and distributors' stocks for each SKU. This information then was provided for each Regional Manager as a regional sum, and their acceptance or revision was asked.

Following this stage, the regional forecasts were integrated together with the analytical forecasts obtained by running three forecasting methods using the past 36 months' sales data, corrected for seasonality, price, promotion, and advertisement effects. The resulting forecast intervals for each SKU were passed into the second phase of DFPOS run, where the weekly production orders for the next 12 weeks were obtained. In this process, annual budget figures and market research parameters also were taken into account.

Implementation of DMIS continued smoothly, since there was an urgent need for such an operating system to run the new distributor system. DFPOS was launched in 1997; however, it could not be implemented successfully, because between 1997 and 1998, the top management of NMKC had been almost completely renewed, and there were more urgent organizational problems to deal with.

Between 1997 and 1999, Nazar Group's operations grew considerably, which required more synergy between the production and marketing companies. However, it seemed to Batu that the production companies were making their production plans on their own, while NMKC was trying to respond to market dynamics in the short term. As a result, the group management meetings were dominated by inconclusive discussions between the marketing and production people.

In the Management Council, Batu argued that the group management team had not been able to manage the Nazar supply chain efficiently. Thus, the subsystems developed that far had to be integrated further in order to establish more group synergy. Batu commented:

From my side, supply chain management concept is a management model which extensively utilizes the systematic approach to run the business. ... Our efforts/practices could not be seen as the picture of a developed supply chain and its administration, but only a part of it. These efforts only show our consciousness on the way to have a supply chain management system and its practice. The transition is still going on. (See Chandra and Kumar, 2000; Ho, et al., 2002; Kopczak and Johnson, 2003; Larson and Halldorsson, 2002; Mentzet et al., 2001; for reviews of supply chain management).

After long discussions, the Management Council accepted Batu's proposal and, in addition, decided to move the group management from production-focused (push-type) orientation to a more customer–focused (pull-type) one.

In 1999, the General Manager of NFC and the Technical Coordinator left the group, which was the initial sign of change. Batu had to revise his implementation strategy; thus, he had to determine where to start the integration project and how to proceed. In 2000, a new Technical Coordinator was hired as a council member, who also had background in supply chain management. He became Batu's major partner in system design.

CASE DESCRIPTION

In mid 2000, Batu decided to start the integration project right at the interface between Production and Sales, where the majority of management problems originated. He formed a steering committee, which assigned certain projects to cross-functional project groups. The steering committee reported to the Management Council. The objective of the initiative was to develop and implement an IS, called Production-Inventory Management System (PIMS), which would integrate sales forecasts coming from NMKC and production planning, while optimizing the overall operational efficiency of the Nazar supply chain.

Prior to the PIMS project, Batu pointed out that production companies were undertaking pseudo-production planning activities without an obligation to meet production orders taken from DFPOS. Although a production order for each product was given each month, orders were rarely met. For this reason, production cost control in that kind of environment had been very difficult. Finch and Luebbe (1995) state that planning for operations is essential because operation function controls a large percentage of a firm's resources, including inventories, capacities, and workforce.

Basic supply chain components of Nazar Group are shown in Exhibit 5, where the system boundaries of PIMS and its relational diagram also are indicated. Having looked at this picture, Batu realized that in the first stage of the project, conceptualization of PIMS had to be agreed upon collectively. To this end, many project meetings were organized where production, marketing, and procurement people were presented with a number of alternative approaches to system design. After many discussions, a list of protocols was established between marketing and production, and another one between production and procurement functions under which the selected system (shown in Exhibit 6) was defined.

The protocols were designed to underline the responsibilities of both parties and to resolve or avoid conflicts. For instance, under the protocol between marketing and production, the planning period was established as 12 weeks rolling horizon and the time step was taken as one week. Therefore, NMKC had to enter the sales forecasts for 12 weeks for each SKU. That is, every week, sales forecasts for the following 11 weeks could be revised, and the 12th week had to be entered for the first time. Sales forecasts, however, only could be revised under certain revision limits that were previously agreed upon. The correlation between weekly sales forecasts (revised) and actual shipments was a part of performance measurement for NMKC. On the other hand, the production company was responsible for the realization of production orders and preparation of stocks, including safety stocks, for shipment in the beginning of the assigned week. The correlation between production orders and actual production was a part of the performance measure of the production company.

Under the protocol between production and procurement, the production company was responsible for validating daily raw material usage, while it was procurement's responsibility to update supplier information, net cost of procurement, batch sizes, and so forth. Also, it was the procurement department's responsibility and its performance measure to provide the correct materials at the required time. To this end, the materials were divided into two groups; namely, major and minor materials, where the major materials were the ones with high usage, short shelf-life, or short leadtimes (less than two days), and minor materials were the ones with low usage or long leadtimes. It was agreed under the protocol that the procurement department would have to provide minor materials needed at the beginning of the week and provide major materials not longer than two days before their use. The timing of usage of the materials was given by the Production Planning Program (PPP) output (see Exhibit 7).

Having established the systems concept, Batu decided to move forward to the next stage, where a number of project groups would examine the MRP, production, production planning, human resources, and warehousing functions in order to identify their weaknesses under the new system requirements. After several upgrading studies, these functions were improved, especially, in terms of IT and decision-making abilities. User terminals were transformed into Web-based, and the underlying database operations were streamlined to achieve a higher speed of data exchange. Also, the connections to remote locations, especially within factory floors or warehouses, were improved.

In the mean time, a group of analysts started the development of PPP with an objective of generating a 12-week production plan that utilized production means and sources in the most economical way. To this end, PPP was designed as a hierarchical optimization model (Schneeweiss, 1999), as shown in Exhibit 7. At the Master Production Schedule (MPS) level, the optimal weekly production plan for the 12-week planning horizon was determined. This plan optimized the use of production line capacities in order to fulfill the sales forecasts and safety stock requirements so that shortages and inventory carrying costs were minimized. MPS was modeled as a periodic review, partial backlogging, and capacitated production-inventory model (Hax & Candea, 1984).

The output of MPS (weekly production quantities) was entered into the Scheduling Model. This model used a heuristic solution procedure to obtain the detailed production schedules for 63 shifts (three weeks) that minimized the completion times and setup losses. The output of the Scheduling Model was entered into the Assignment Model, which determined the optimal workforce assignments for the 63 shifts given by the Scheduling Model so that the use of workforce skills was maximized. Under this hierarchical structure, an iterative method was used so that the lower-level optimization programs checked feasibility of the higher-level program solutions. If the feasibility test did not pass, then the higher-level program searched for the next solution. The iterations ended when a feasible and satisfactory solution was obtained.

The MPS model, developed for one of NFC's plants where 120 SKUs were produced in 12 production lines, was structured as a Mixed Integer Programming (MIP) model with about 10,000 constraints and 5,000 decision variables. The Scheduling and Assignment models also were designed as MIP models with 52,000 constraints and 41,000 decision variables, and with 4,500,000 constraints and 5,350,000 variables, respectively. The optimization models were developed using GAMS modeling tool. The iterative hierarchical solution procedure was developed in-house using a C++ code, which called in Cplex solver for MIP. The entire system is located in a server with 2 GB RAM and 2.4 GHz Pentium IV microprocessor. It took 90 minutes for the program to obtain a satisfactory solution.

One of the critical success factors of the project was the effective use of IT so that the resulting system would allow fast and accurate decision making and be open for future system extensions. This required a careful database management on the mainframe, because there were many distributed network users from different disciplines, and their interactions involved data entry, report/graph viewing, and local decision making.

In the next phase of system integration, Batu decided to launch user training programs. MRP users were trained for the use of materials management according to new rules. Human resource departments at the production companies were trained for updating operator skill levels, developing operator training programs, and getting performance measurement information. Also, the production planning people at the production companies were trained for updating product and process parameters, setup times, operator skill definitions, and so forth.

In the last quarter of 2001, Batu decided to launch the PIMS system starting at one of NFC's production plants. There were minor IT- or IS-related problems, which were solved immediately. However, there was major resistance from both production and marketing users, but not from the procurement people. In fact, in the beginning of 2001, a new general manager was hired for NFC and appointed to the Management Council as well, who was hesitant to show leadership for implementation, since most of the major decisions were made before him.

The production people also were arguing strongly about the success of the new production paradigm (customer-focused, planned production), and they were defending the performance of the old paradigm (production-focused, myopic production planning), where they enjoyed full control of production resources. For instance, they claimed that the finished goods inventories were higher compared to one year before. However, after a short analysis, it was shown that the difference originated partly from the safety stocks, which did not exist before, and the rest of the stocks on weighted average were moving at a rate faster than before. Batu thought that the production people were used to giving short-term tactical decisions, which mostly optimized local factors, and they were not willing to see easily that PIMS was concerned about group-wide optimization that involved longer-term strategic decisions; for this reason, the model outputs seemed flawed to most users.

Marketing people also were resisting change. The sales forecasts coming through DFPOS were still short-sighted. They were complaining about PIMS not being able to adapt to changes in the market quick enough, which, they argued, had been leading the company to a high loss of sales.

Amidst all these low user adoptions, the system was operating technically quite smoothly. Batu was able to reply to almost all of the complaints with performance measures. These complaints continued until mid-2002, when Batu decided to move ahead and promote his project leader as Supply Chain Group Manager, thereby collecting most planning decisions under one manager. From that point on, PIMS was administered by this group manager, who was knowledgeable about the entire system.

In 2002, the sales grew 12%, and the market share rose 2%, while the Management Council decided to remain neutral about PIMS. In 2003, Batu decided to include the other NFC plant and Bonjuu Foods under PIMS. The implementation took about nine months with almost no implementation problems on the production side. DMIS also was upgraded from a dial-up connection to a Web-based application in 2003, adding features to streamline the process and adding value for the distributors. Since the distributors are Nazar's customers in its supply chain, this application is hoped to form a basis for more collaboration. (See Fawcett and

Magnan, 2002, for a study of supply chain integration practice; and Lancioni, et al., 2003, for Internet application trends in SCM.)

CURRENT CHALLENGES/PROBLEMS FACING THE ORGANIZATION

By the end of 2003, all existing production lines were administered under PIMS except for those in the new chocolate plant, which would be joined later. It seemed to Batu that a procurement and production mechanism was built, which operated at a reasonable efficiency; however, the sales forecast errors were still too high to get the most out of this system. The marketing people were still operating the system with shortsighted forecasts, which led to imposing too many forecast changes and thus, higher stock levels than expected. In return, this often caused wrong management concerns about the effectiveness of PIMS. It seemed to Batu that adapting marketing people to change would take longer than expected, and he had to initiate another process to motivate them.

Batu also believed that the group management organization was not adequate anymore for the current size of the overall supply-chain operations. Under the current group management structure, the cross-functional decisions were not made as fast nor as effectively as they should have been. As a result, the implementation of PIMS was affected adversely by the lack of a collaborative group management platform. In fact, all collaborative group operations, such as product development, were affected adversely by the current management structure. Thus, the problem would have to be solved through a holistic strategic management approach.

On the other hand, users were complaining about the long response time of the system, as they were trying to test the performance of several implementation scenarios. Batu believed that there were still a number of improvements to be realized about the optimization algorithms within the PIMS and MRP systems in order to speed up the overall solution time. The current runtime of about 90 minutes seemed to be a practical limit to undertake what-if type manual decision interventions regarding the use of production resources, such as overtime or hiring/firing decisions.

In addition, there had been a strong demand from users in that they needed more variations about the output report formats. Batu considered these continuous improvement projects as a step toward higher user adoption, where he placed utmost emphasis.

Note: Dedicated to the memory of Mustafa Ozturk.

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APPENDIX

Exhibit 1. Financial data — Nazar Group of companies

Year	2003	2002	2001	2000	1999
Total Sales (tons)	111,214	101,887	90,817	74,462	62,816
Total Revenue (million USD)	260	175	145	153	126
Export (% of Total Revenue)	13.6	9.83	13.8	6.7	0.4
Market Share (%)*	33	32	30	29	30

**Nielsen data*

Exhibit 2. List of group management team members, all placed under the payroll of NFC

- President (family member)
- Vice President of Procurement (family member)
- Vice President of Planning and IT
- R&D Coordinator (family member)
- Technical Coordinator
- Finance Coordinator
- Human Resource Coordinator
- Group Auditor

Exhibit 3. List of management council members

- President (family member)
- Vice President of Procurement (family member)
- Vice President of Planning and IT
- R&D Coordinator (family member)
- Technical Coordinator
- General Manager of Nazar Marketing Company
- General Manager of Nazar Foods Company
- External Consultant for Finance
- External Consultant for Public Relations
- Two Family Members

Exhibit 4. Top-level organization charts of Nazar Foods and Nazar Marketing Companies

- Nazar Foods Company Board
  - General Manager
    - Production Manager
    - Production Planning Manager
    - Technical Manager
    - Quality Assurance Manager
    - Finance Manager
    - Personnel Manager
    - Plant Manager (Rusk Factory)
    - Plant Manager (Chocolate Factory)

- Nazar Marketing Company Board
  - General Manager
    - Marketing Director
      - Sales Forecast Manager
    - Sales Director
      - Eight Regional Managers
      - Chain Stores Manager
      - Transportation Manager
    - Export Director
      - Country Managers
    - Planning Director
    - Finance Manager

Exhibit 5. IS components under Nazar Group supply chain

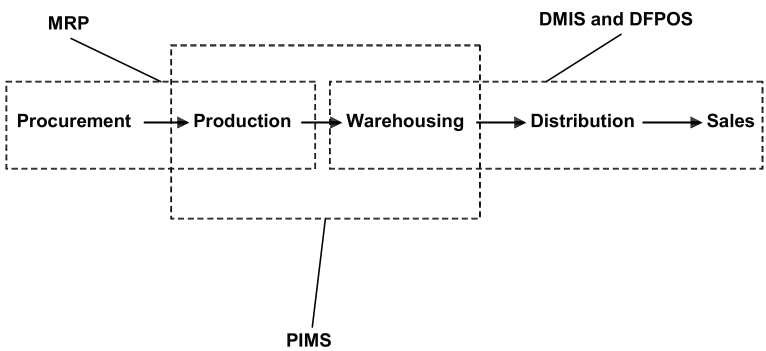


Exhibit 6. Conceptual overview of production-inventory management system (PIMS)

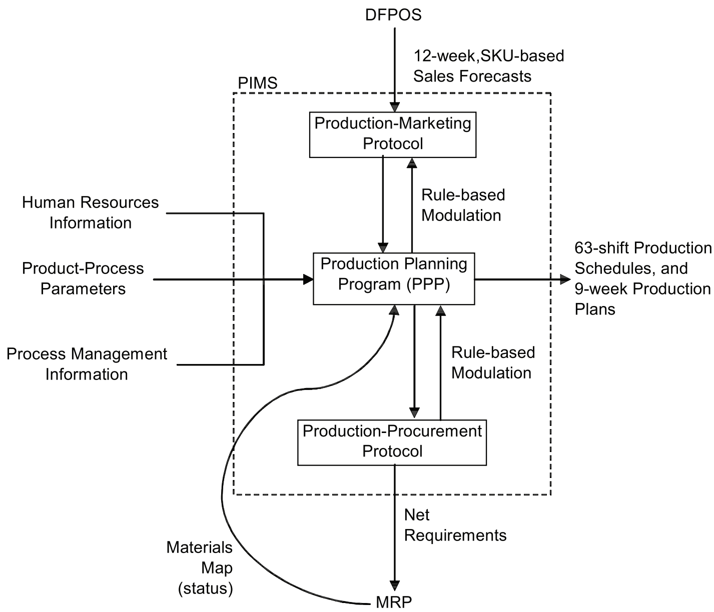
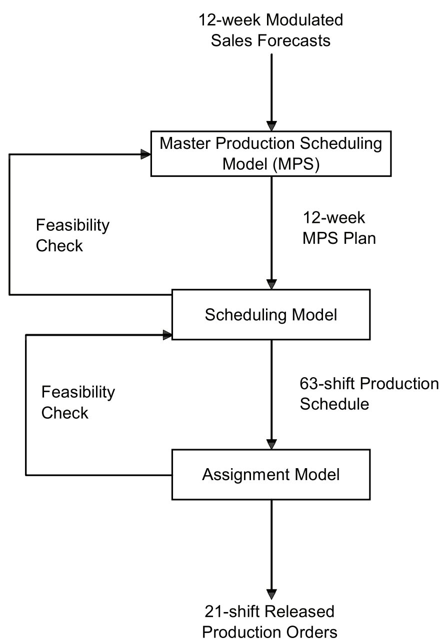


Exhibit 7. Production planning program (PPP) system design



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Chapter XXI
The Expansion Plan of TeleDoc:
What and How Much of the Technology Employed is to Change?

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Naresh Singh, ICFAI Business School, India

Executive Summary

The TeleDoc project of Jivan Institute has combined mobile commerce and the ancient concepts of Ayurveda for treatment of rural residents of India for whom health services are still available only in dreams. Using GPRS network and J2ME applications on Nokia 6800 mobile phones, TeleDoc field workers are reaching the remotest villages of India with the promise of possible Ayurvedic treatments for subsequent illnesses. With cash-positive results in the first year of operations, TeleDoc wants to expand in a big-bang way by covering 10,000 villages in 2006. They also want to improve the service quality by using real-time video streaming. But many members of the TeleDoc technical team are skeptical whether the existing GPRS-based solution will serve the purpose or not. There are different priorities in the team (e.g., cost-effectiveness, quality of service, availability, immediacy, cost-of-change, etc.). The IT consultant has many options, but getting the priorities sorted out is the daunting task at hand.

ORGANIZATION BACKGROUND

Life is just a phone call away with far fewer side effects than hi-fi medicines with loads of chemicals in them. In rural India, where modern medical care is almost nonexistent (UNDP, 2004), Jivan International has launched a project called TeleDoc.

Jivan Institute is an R&D organization founded primarily on a social enterprise model. It has operational bases in India, the U.S., and the UK. It is a not-for-profit organization that has been working since 1992. The vision statement of Jivan mentions that it aims to foster sustainable development by producing innovations that improve practices of education, health, and social enterprises. Regarding health services, the vision is to create affordable health products and services that integrate indigenous and modern health systems, and delivery methods that use innovative technologies.

Jivan focuses on three major service domains: education, health, and social enterprise development. In education, it operates by providing quality learning resources and technologies to underprivileged segments of societies (e.g., a significant chunk of the population in rural India (Prahlad, 2004). In the social enterprises sector, Jivan helps non-profit or self-supporting organizations or groups by allocating necessary operating funds and applying efficient management techniques for better performance, formulating their revenue generation models using innovative ways, and using enabling technologies. It provides training programs for NGOs, conducts programs like Learning for Earning to promote innovative revenue models, and also is instrumental in designing and establishing initiatives like Baatchit for developing multilingual, community-based software and CLIC (Community Learning and Information Centers).

In health sectors, the effects of Jivan's innovative technology usage have been phenomenal according to the experience of the service users, who are the rural residents of India. People in remote villages where no health service has bothered to spread its arms have found a solution through Jivan's Teledoc program that connects the villagers to the world of indigenous Ayurvedic medicines. In 1995, Jivan was the first to launch a Web site on Aryurveda. Ayunique is an online consulting service that enables people to access the vast knowledge repository of Ayurvedic medicines and healthy remedies. The site is e-commerce-enabled by a feature called AyurBuyer, through which people can buy remedies that are prescribed to them online.

This site constantly assists the TeleDoc project team. Exhibit 1 shows how the operational model works. The Web site encompasses more than 1,800 pages with detailed Ayurvedic remedies and consultation information. More than 10,000 patients have been treated online and have received help only from the site until December

2004. The Web site has delivered a blended value of more than $230 million for 66,000 patients from 1995 to 2004.

The Structure

The first visible strategic as well as operational layer of management structure of Jivan is the Board of Directors. Among them, R.P. Chauhan, a post-graduate engineer with more than 20 years of experience in quality systems in India and the U.S., is the founding president. The director of educational services is Steven Rudolf, an American educator. The director for Jivan Ayurveda is Dr. P. Chauhan, a degree holder in Ayurvedas from the University of Delhi.

Jivan's advisory board members also play an important role in the background. N. Ayyar, the IT consultant, has more than 30 years of experience that includes positions as the founding medical doctor of Dell India. Another well-known figure is Professor A. Pentland, the former academic head of MIT Media Laboratory, a pioneer in research on smart environments and technologies in developing countries. There are other eminent persons, like Dr. Terry Whitaker, the famous media personality; Dr. S. Sadagopalan, founding director of IIIT Bangalore; and Dr. F. Mednick, an eminent researcher in education and a writer.

Financials

As a non-profit organization, Jivan aims mostly at cost recovery (Williamson, 2000). Consequently, it has three major sources of revenue: selling the products and services and earning revenue; grants and strategic philanthropy; and capital market financing (i.e., loans). Even though it is a non-profit organization, it runs like any other professionally managed business organization (Singh, 2003). Therefore, the revenue earned through selling services and products is the biggest proportion. Insofar as the operational financial model of revenue generation of TeleDoc is concerned, Jivan charges its TeleDoc patients INR 70 per consultation, which includes medicines. Initial funding was received from Soros Foundation in July 2003, with about 25 patients. By June 2004, TeleDoc had covered patients generating a cash surplus of INR 1,53,860 (see Exhibit 2 for detailed information).

SETTING THE STAGE

Technical Framework of Teledoc

The technical framework of the TeleDoc project includes three major dimensions: Nokia 6800 for mobile messaging from remote areas for passing on the information about a patient's illness, GPRS as the data network, and J2ME-based applications loaded onto the mobile handsets. Nokia 6800, a messaging-centric phone, suits the requirements of TeleDoc field workers reasonably well, since it has features like a full keyboard, support for concatenated (long) SMS, MMS, POP, IMAP e-mail, and instant messaging. It also has other general features like voice commands, recording of memos and conversations, notepad application for brief notes (up to 3,000 characters), to-do list with priority levels and so forth in a limited capacity, which are of indirect benefit to the TeleDoc workers. It also has some preloaded Java applications (e.g., e-mail client, instant messaging, converter, portfolio manager, etc.), which the TeleDoc field workers find useful for interacting with the doctors who provide services online The handsets are compatible to GPRS, and Java. J2ME (Java 2 Micro Edition) is a feature that allows these mobile devices to run small, user-installable software applications. The TeleDoc MIS (Mobile Information System) is based on J2ME. J2ME applications generally are known to provide specific functions such as a tip calculator. They can be custom-written specific applications, too, which is the case in TeleDoc's context. They can be Internet-enabled, passing data, for example, through the wireless network in real time (Bhattacharya, 2004). In TeleDoc's case, these J2ME applications are developed to create data entry and retrieval interfaces (Exhibit 3). They run on Symbian operating system. All major application interfaces in TeleDoc are small J2ME programs by themselves; for example, the main menu with options like New Registration, Edit User Info, New Consultation, Doctor's Reply, and so forth.

Case Description

The technical framework along with the operational model of TeleDoc (Exhibit 1) is enabled by the three major components that work in this fashion. The TeleDoc field team collects data about illness and symptoms from rural patients on a case-by-case basis, roaming around the villages under TeleDoc coverage. This information is input to the GPRS data network through the J2ME application interfaces (e.g., patient records). These data elements reach the central database of TeleDoc doctors at the Jivan clinic (Exhibit 4). The doctors go through the descriptions of every case, and corresponding treatment procedures and prescriptions are messaged back to the TeleDoc field workers. The TeleDoc field workers, in turn, collect the prescribed medicines from their local franchisee and distribute them to the patients. The consultation fee and medicine fees are collected by the field workers and sent back to the central office via the franchisee network.

For the doctor's access to information, all the doctors registered with Jivan for Teledoc consultation have been given a username/password combination. By logging on through the Internet to the TeleDoc site using username/password combinations, doctors can see the New Consultations on which they are supposed to reply, their individual case files that contain data on the previous cases handled by them, and the case histories of their previous patients in tabular forms. The consultation details include the patient's personal details, symptoms, family history, information about any treatment/medicine being used now or in the recent past, eating habits (veg/non-veg), information on smoking, drinking, sleeping patterns, and so forth. Their prescriptions also need to be detailed (i.e., include the precautions to be taken and other necessary directions.

GPRS (General Packet Radio Service) is used as the data network for TeleDoc, primarily a non-voice, value-added service that allows information to be sent and received across a mobile telephone network. Technically, it supplements Circuit Switched Data and Short Message Service. Theoretical maximum speeds up to 171.2 kilobits per second (kbps) are achievable with GPRS by using all eight timeslots at the same time. This is about three times as fast as the data transmission speeds that are possible over the fixed telecommunications networks and 10 times as fast as current Circuit Switched Data services on GSM networks. By allowing information to be transmitted more quickly, more immediately, and more efficiently across the mobile network, GPRS is seen by TeleDoc implementers as a relatively less costly mobile data service compared to SMS and Circuit Switched Data. GPRS also facilitates instant connections whereby information can be sent or received immediately as the need arises, subject to radio coverage. No dial-up modem connection is necessary—another requirement of TeleDoc field workers. Via GPRS, field workers are referred to as being always connected. High immediacy is a required feature for time-critical applications such as TeleDoc, where a quick action and response means life or death for a patient to be treated with medicines immediately.

For the doctor's side, GPRS works as it enables the Internet applications on the desktop from Web browsing to connect and messages/prescriptions sent via the mobile network. Other applications include file transfer and ability to remote access, which are sometimes used by the doctors.

From the technical perspective, GPRS involves overlaying a packet-based air interface on the existing circuit switched GSM network, thus enabling the packet-based data service that is used in TeleDoc implementation. With GPRS, the information is split into separate but related packets before being transmitted and reassembled at the receiving end. Therefore, packet switching means that GPRS radio resources are used only when users actually are sending or receiving data, which makes it a cost-effective option for TeleDoc rather than subscribing to a dedicated radio channel for a fixed period of time. Also, because of better bandwidth utilization, the availability of a GPRS network is suitable for TeleDoc applications where, like immediacy, availability of the network is a crucial operational parameter. In GPRS, the available radio resource can be shared concurrently among several users. This efficient use of scarce radio resources means that large numbers of GPRS users potentially can share the same bandwidth and be served from a single cell. The actual number of users supported depends on the application being used and how much data are being transferred. Because of the spectrum efficiency of GPRS, there is less need to build in idle capacity that is only used in peak hours. GPRS thus can help to maximize the use of network resources in a dynamic and flexible way, along with user access to resources and revenues.

For the TeleDoc doctors, another technical requirement is Internet connectivity to the wireless data network in order to link them straight to the field workers. Toward this end, GPRS fully enables Mobile Internet functionality by allowing interworking between the existing Internet and the new GPRS network. Any service that is used over the fixed Internet today (e.g., File Transfer Protocol (FTP), Web browsing, chat, e-mail, telnet) is as available over the mobile network because of GPRS. Therefore, the choice of GPRS for TeleDoc implementation has worked well and has been the primary reason for choosing Nokia 6800 with messaging and GPRS supporting features.

Now, enthused by the cash surplus, the response of the rural patients, and the social impact of the project, the TeleDoc team is planning for a nationwide expansion. It intends to provide consultation to 9 million patients in 1,000 villages by the year 2006 through the existing operational model (i.e., the network of franchisee). For scaling up, TeleDoc is planning to issue a franchisee license to medical distributors who will be Jivan employees. The TeleDoc MIS consequently has to go to scale. One field worker will cover 10 villages using Nokia 6800. One franchisee will cover about 100 villages consisting of 10 field workers and one supervisor.

At this level of volume, financial projections show that TeleDoc can be cash-positive with a net surplus of $1 million per year. But scaling up has other challenges.

CURRENT CHALLENGES/PROBLEMS FACING THE ORGANIZATION

Scaling Up with the Existing Technical Framework? Or Go for a New Solution?

GPRS, as the TeleDoc technical implementation team suggests, has been able to deliver the kind of services it required in a very cost-effective way. But now, with the huge expansion plan, the team is facing the questions of whether GPRS will still continue to deliver results as they go up-scale or whether they will have to design a completely new technical framework and telecom network. For large-scale operations with the same or better levels of efficiency and immediacy requirements, GPRS is not seen as a very viable option by their technical team members. There are ample reasons why they are bothered while pondering the success of GPRS in up-scale operations.

One significant point of concern is the limited cell capacity in GPRS. There are only limited radio resources that can be deployed for different uses—use for one purpose precludes simultaneous use for another. For example, voice and GPRS calls both use the same network resources. The extent of the impact depends upon the number of timeslots, if any, that are reserved for exclusive use of GPRS. For long messages (e.g., in TeleDoc's case), especially when it goes up to scale, this limitation can severely affect the network's availability and, consequently, TeleDoc's service availability and, therefore, people's trust in the service quality.

Speed is always one major area of concern whenever data transfer volumes are going to get bigger (e.g.,, in the case of an operational expansion as in TeleDoc's plan), and here, the data rates also are required to be maintained with the same or better value in order to maintain similar or better quality of service. Regarding this, many of the TeleDoc Technical team people are concerned that speed will be much lower in reality with increased data load.

Achieving the theoretical maximum GPRS data transmission speed of 172.2 kbps would require that a single user take over all eight timeslots without any error protection. When TeleDoc operations go up to scale, many more than the existing number of doctors and field workers will have to simultaneously connect and share the bandwidth. Also, it is unlikely that a network operator will allow all timeslots to be used by a single group of GPRS users. Additionally, the initial GPRS terminals are expected be severely limited—supporting only one, two, or three timeslots. The bandwidth available, therefore, will be severely limited. In such situations as contemplated, virtual circuits or leased lines appear to be more reliable options for TeleDoc team members than the existing GPRS-based network.

Another concern also is related to the service quality that is the problem of delays. Along with the geographical expansion and volume growth, TeleDoc also wants to improve the quality of its service value offering. So far, the data transmitted by the TeleDoc field workers primarily has been text data. But they intend to use the full features of the Nokia phones that the field workers already have; for example, multimedia messaging. One example situation is that the TeleDoc team suggests that the field workers can directly transmit MMS/video in real-time to the doctors, which will show them the patient's condition over video transmission in real time. Now, being a packet-switched network, GPRS packets are sent in all different directions to reach the same destination. This opens up the potential for one or some of those packets to be lost or corrupted during the data transmission over the radio link. The GPRS standards recognize this inherent feature of wireless packet technologies and incorporate data integrity and retransmission strategies. However, the result is that potential transit delays can occur.

Because of this, applications requiring broadcast quality video can be better implemented using High Speed Circuit Switched Data (HSCSD). HSCSD is simply a Circuit Switched Data call in which a single user can take over up to four separate channels at the same time. Because of its characteristic of end-to-end connection between sender and recipient, transmission delays are less likely. This is seen as a viable option to some members in the TeleDoc technical team who are concerned primarily with improvement in quality of service.

N Ayyer, the IT consultant, is a technically knowledgeable man. But he also is sharing the concerns that his team members have voiced, as mentioned. His team has different views and priorities now when the future strategy has already been decided to go up-scale in a big way. Some of his team members are more concerned with service quality; some are giving more importance to cost-effectiveness of the technical framework, the one-time and recurring costs of which would visibly increase with the scaled-up operational framework. GPRS on Nokia 6800 so far has delivered the results with an acceptable level of service quality. Shifting from this tried-and-tested model would mean further one-time costs of changing the necessary networking elements in the system, depending on which other option is chosen. But the problems with GPRS, as many of his team members are suggesting, also are not ignorable all together, as the failure of the technical framework can affect the future of the entire project in an adverse way.

Ayyar is worried now about the changes to be made. The first point, according to him, is whether any change is necessary at all, because the existing system have been working fine so far with the limited operational framework. But with the expansion plan actually in place, his team members are having real doubts about the quality of service delivery with the existing GPRS-based solutions.

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ENDNOTE

This is based primarily on the interviews taken by the case writers of the company employees.

APPENDIX

Exhibit 1. The operational framework of TeleDoc project

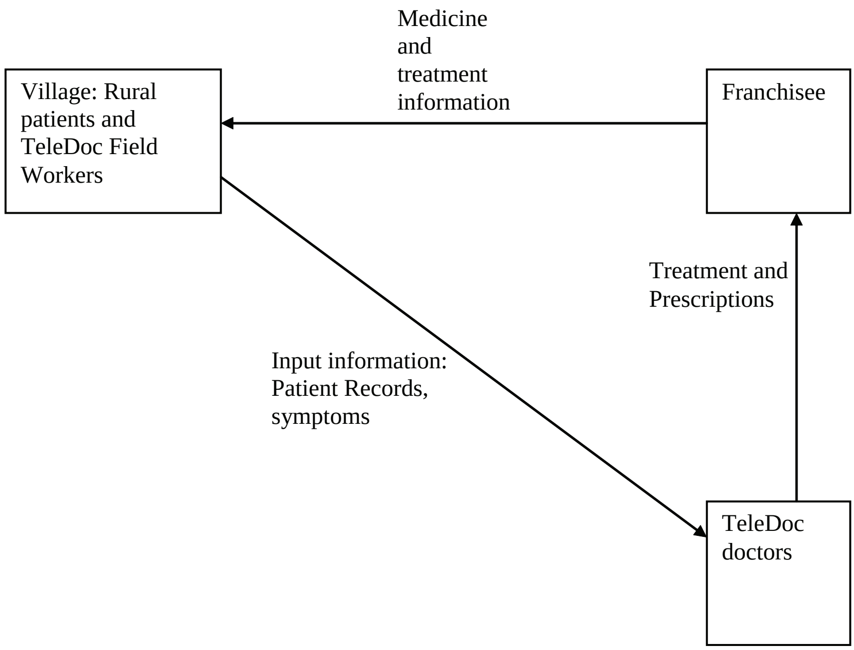

Exhibit 2. Financial data (in INR)

Year	Consultation + medicine fees received from patients	Cost of medicine	Salary to Doctors and field workers	Network utilization costs	Fixed costs: IT and others	Net surplus
July 2003 -June 2004	492240	123060	148600	24720	42000	153860

Note: INR = Indian Rupees; 1 USD ~ INR 43

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APPENDIX CONTINUED

Exhibit 3. The TeleDoc MIS mobile interface

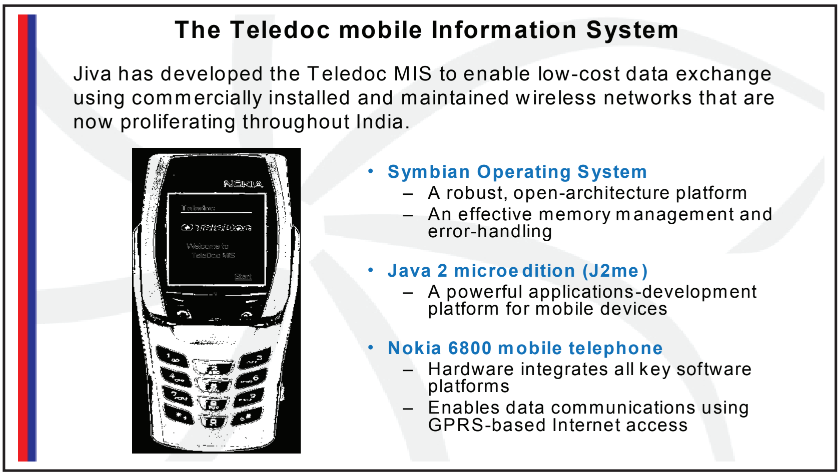
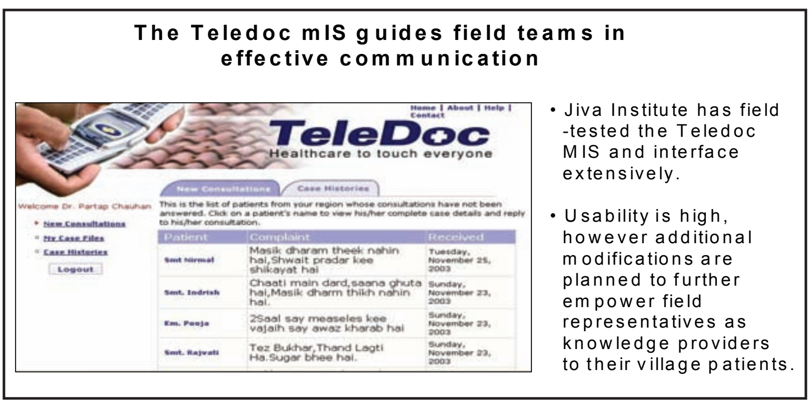


Exhibit 4. The TeleDoc doctor's online interface



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AaaaPPENDIX CONTINUED

Exhibit 5. On HSCSD

HSCSD.

A further enhancement to the existing GSM network is the new High Speed Circuit Switched Data (HSCSD) service. HSCSD introduces two new technologies to the existing GSM network. First, it increases the maximum user data rate that can be transported per GSM time slot from 9.6 kbit/s to 14.4 kbit/s by employing a new coding scheme with less error protection capabilities. Thus providing more space for user data per time slot. Second, with HSCSD up to four time slots can be allocated for one data call.

The introduction of HSCSD within existing GSM networks is also very simple as the update can be achieved by software upgrades. HSCSD can be used in conjunction with both 9.6 kbit/s and 14.4 kbit/s bearers, enabling a maximum data transfer speed of up to 38.4 kbit/s (9.6 kbit/s bearer) or up to 57.6 kbit/s (14.4 kbit/s bearer). However, HSCSD with the 14.4 kbit/s bearer service cannot be implemented within 900 MHz GSM networks, due to the resulting requirement for superior radio channel conditions. Because of the new coding scheme with less error protection capabilities, the 14.4 kbit/s bearer service can only be implemented within the 1800 MHz GSM networks. The biggest disadvantage of HSCSD is that it is very expensive for the user. Four channels means you have to pay four times.

HSCSD offers both transparent and non-transparent types of service so that all sorts of circuit switched applications can be used. For non-transparent (NT) HSCSD calls, the number of timeslots can be changed during the call, and can be allocated asymmetrically with more bandwidth in the downlink than in the uplink. With NT HSCSD, there are no hand-over problems, because the time-slots will be allocated according to availability. For transparent HSCSD calls, the number of timeslots cannot be changed during a call. With transparent bit-rates, HSCSD offers constant bit-rates and transmission delay, very useful for video applications requiring a constant rate of transmission.

Source: http://mobileinternetguide.org/html/ch01s01s04.html

continued on following page

APPENDIX CONTINUED

Exhibit 6. About GSM

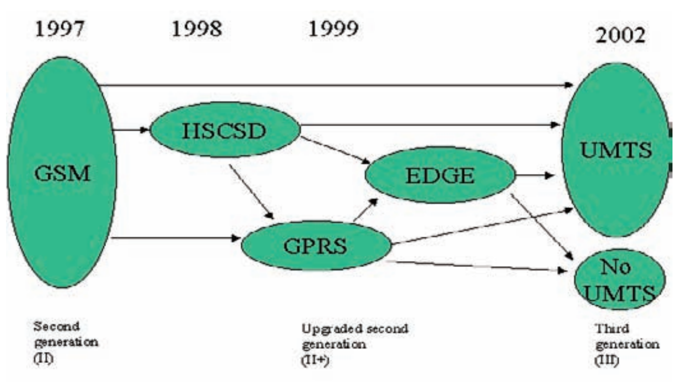
Cellular/PCS networks can use different types of mobile networking protocols that allow for roaming—the use of a mobile phone while away from the home area—and advanced services. Global System for Mobility (GSM) networks deployed in Europe and throughout the world utilizes a protocol called the GSM Mobile Application Part (MAP), standardized by the European Telecommunications Standards Institute (ETSI). Other TDMA-based networks and CDMA networks utilize a protocol called ANSI-41, a protocol standardized by the Telecommunications Industry Association (TIA) and the American Standards Institute (ANSI). While there are various proprietary-based mobile intelligent network (IN) technologies, the standards-based technologies are often of most value to the mobile network operator and its customers. These standards-based technologies are referred to as Customized Applications for Mobile Enhanced Logic (CAMEL) and Wireless Intelligent Network (WIN) and are used in GSM- and ANSI-41-based networks, respectively.

Exhibit 7. About mobile evolutions

The evolution of mobile networks is progressing from the existing second-generation mobile networks to the third generation of networks that is able to handle high-speed multimedia traffic. The migration path to the third generation (UMTS) is far from clear. There are several routes that may be taken, as shown in Exhibit 8.

Source: http://keskus.hut.fi/opetus/s38118/s98/htyo/54/index.shtml

Exhibit 8.



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Chapter XXII
Process-Aware E-Government Services Management:
Reconciling Citizen Business, and Technology Dynamics

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Executive Summary

E-government is becoming a reality rather than a theoretical ambition; however, achieving the e-government anticipated benefits is still illusive, which is exacerbated by the continuous and ever changing business processes, IT, and user requirements. This article outlines the current state of e-government research and the challenges emerging from the need to integrate citizen, business, and technology into seamless e-government solutions and services. In addition, the article proposes a semiotics-informed framework for process-oriented e-government services, modeling, and management, which is used and tested on laboratory-based case studies.

ORGANISATIONAL BACKGROUND

E-government is often seen as an instrument for public sector modernisation, including efficiency improvement and wider-access to national and regional public services via ICT (Liu et al., 2005b). Though, as reported in early studies (Adeshara et al., 2004; Cohen & Eimicke, 2002; Dittrich et al., 2002; Huang et al., 2005; UNEAS, 2003; Wagner et al., 2006), the level of adoption of e-government varies widely across regional and national boundaries, and is very much affected by economics and sociotechnical factors, with little to no citizen involvement in the design of e-government services. Such a participative approach is already provided in many e-commerce portals, and has been highlighted in the UK 7-point action plan (Prime Minister's Strategy Unit, 2005), setting a priority to implementation personalisation of eServices, as highlighted by Leadbeater (2004), 'By putting users at the heart of services, enabling them to become participants in the design and delivery, services will be more effective by mobilising millions of people as co-producers of the public goods they value.'

Much research and development is now underway focusing on many aspects of e-government ranging from e-citizen, e-services, to e-administration, with focus of many research concerns including risk management, data and knowledge management, and interoperation, information interchange standards and design frameworks for e-government systems such as: Yet, numerous recent reports are still reporting on the general 'software crisis' (Gibbs, 1994; RAE & BCS, 2004) within e-government; that is, e-government services are failing to deliver promised functionality (The Economist Reportage, 2000; Heeks, 2003), including on cost and on time delivery.

Setting the Stage

Given year-on-year cost saving demands on the public sector to reduce operating costs through more efficient purchasing strategies (Gershon, 2004; Office of the Deputy Minister- ODPM, 2003), e-Reverse Auctions. (e-RAs) represent a viable strategy to support objectives. However, in spite of the perceived cost saving benefits, recent studies (e.g., B2B Research Centre, 2003; Beall, Carter, Carter, Germer, & Jap, 2003; Emiliani, 2006; Jap, 2002, 2003) suggest some deficiencies in the e-RAs process. Emiliani (2006), points out that 'poor sourcing decisions, higher costs, and less cooperative supplier relationships are a common result of e-RAs—the opposite of what buyers hoped to achieve from e-RAs' (p. 6). Lapiedra, Smithson, Alegre, and Chiva (2004), for instance, found that suppliers who had won an e-RA by bidding below their margins could quickly recover these initial losses in later negotiations, therefore questioning the predictive value of the bidding process. The consequence of this is that buyers may actually pay more in total cost of purchase than they would have done if they had chosen one of the more realistic supplier bids (Lapiedra et al., 2004). Kern and Willcocks (2002) found that most buyers and suppliers realise the importance of adequate communication and information exchange for efficient buyer-supplier interaction, but actually fail to address the criticality of this dimension in their relationships. The authors point out that 'to ensure good communication was not an easy process. It often needed through planning of an appropriate communication structure, which few [participants] actually had done' (Kern & Willcocks, 2002, p. 14). This is critical in relation to the generation of equitable buyer-supplier relationships within the Public Sector that has identified e-reverse auctioning as a potential cornerstone of its efficiency pursuits.

Case Description

e-Reverse Auctions emulate closely and address specifically the stated intention for a European Action Plan towards an information society; the so called 2010 project as detailed in the Lisbon agreement. The nature and scope of these initiatives relate primarily to an evaluation of the eProcurment processes used within the public sector through the adoption and diffusion of e-RAs. However, the 2010 framework remains prescriptive and lacks description on how e-RAs should be embraced as realistic strategies and options to traditional tendering. In seeking to evaluate the scalability of e-RAs through developing appropriate criteria to support management decision making, e-RA seeks funding from EPSRC with the aim to "Develop a comprehensive set of business scenarios that are in acted through dynamic simulation models, which demonstrate the impact of different e-RA strategies in support of eGovernment."

The grounding associated with the facilitation of e-government will be through a framework encapsulated from systems evaluation factors that reflect the reasoning, motivations, and preferences of professionals engaged in buyer-supplier relationships. Consequently, e-RA will identify a set of effective attributes, including product type, key informants, market conditions, process issues, and supplier management for eRA efficiency gains to be achieved.

Williamson's (1981) transaction cost economics (TCE) appears to be the most commonly used theoretical background for the investigation of the efficiency of buyer-supplier relationships (Olsen & Ellram, 1997). It combines both behavioural aspects and the economic theory of the firm (Cousins, 2002), thus explaining the circumstances for forming different buyer-supplier relationships by acknowledging both the role of information and the context, a trait which proves particularly useful for e-RA case research.

According to Williamson (1975, 1981), there are two basic governance structures for organisations, namely markets and hierarchies. As each governance structure is associated with certain transaction costs, the goal is to choose the most appropriate one, that is, most efficient structure/relationship. The decision of the right governance structure/buyer-supplier relationship, however, does not only depend on contextual factors (e.g., the level of competition; the level of uncertainty; the frequency of the transaction; the level of transaction-specificity) (Williamson, 1981). Behavioural factors such as bounded rationality of the decision-maker or opportunism, equally affect the decision by directly influencing the information available and that which is taken into account when making the decision. Consequently, the decision on the governance structure is never objective or complete, but rather to a certain extent biased and limited (Williamson, 1981). The basis of this argument, and indeed its relevance to e-RA, is the extent of subjectivity in buyer-supplier relationships. This situation is a result of the dynamics within business processes, which consequently requires significant formalisation through a scaleable methodology.

Within the literature, various classifications and models of buyer-supplier relationships have been suggested, with e-RA being the latest. These models are all based on various criteria, facets, influencing factors, and outcomes. A review of 38 articles reveals several recurrent intrinsic and extrinsic characteristics of buyer-supplier relationships (e.g., Lamming, Cousins, & Notman, 1996). Intrinsic characteristics (e.g., commitment) tend to be regarded as inherent in any relationship and describe the inner nature. Extrinsic characteristics (e.g., success), however, tend to represent certain outcomes or results of the relationship. The function of extrinsic characteristics is not merely descriptive, but directly judgmental in terms of indicating the general quality and efficiency of a relationship. However, Boddy, Cahill, Charles, Fraser-Kraus, and Macbeth (1998) point out that it is far from clear how the performance of a relationship can be evaluated. Following the studies of Gibbs (1998) and O'Toole and Donaldson (2002), reduced costs, delivery time, and the overall quality of the product are the most commonly used objective indicators for the effectiveness of buyer/supplier relationships. Lamming et al. (1996), however, stresses that relationship assessment is not a one-sided, objective affair. It always needs to take into account both the buyer and the supplier's view. O'Toole and Donaldson (2002) found that particularly intangible factors (such as satisfaction) play an important role for determining the actual performance of a relationship. Many authors (e.g., Jap & Ganesan, 2000; Mohr & Spekman, 1994) consider satisfaction as a crucial indicator for successful relationships. The level of conflict (e.g., Jap & Ganesan, 2000; Mohr & Spekman, 1994) appears to be another important indicator for successful buyer-supplier relationships. As the perception of the quality of a relationship is a very subjective affair (e.g., Lamming et al., 1996; Ambrose, 2005), the quality and appropriateness of a relationship in this research will mainly be assessed by relying on the subjective indicators of perceived success, the level of satisfaction, and the level of conflict (Al-Sebie & Irani, 2005).

It is argued that current development practice is mainly crisis driven, with little concern for the effect on the organisational structure or understanding of the benefits to citizens (Akman, Yazici, Mishra, & Arifoglu, 2005; Gronlund, 2000). E-RA is concerned with facilitating the management of change based upon systematic evaluations that reflect the reasoning and preferences of management professionals engaged in procurement auction activities, that is:

- The most suitable interventions for e-RAs
- The constraints and settings for buyer-supplier relationships
- The extent of efficiency gains associated with e-RA change

A primary objective of the case research will be to enable practitioners to relate specifically to their own organisational environments to conceptualise, consolidate, and gain a deeper understanding of knowledge for e-RA change. E-RA will provide guidance for problem solving involved in these difficult organisational governmental contexts. As the public sector strives for improved efficiency and effectiveness, it needs the management ability to monitor the effects of change and learn from existing practice. E-RAs consolidated framework and worksheets for accessing relevant e-RAs and evaluating cross-functional systems will provide an innovative methodology.

CURRENT CHALLENGES

An e-RA case analysis will demonstrate through the development of a visual toolset of dynamic simulation models that local authorities and other public sector organisations can make informed cost-effective procurement decisions at strategic, tactical, and operational levels. This is made possible through the identification and simulation of weighted criteria supportive of procurement transformation relative to policy change driven by a national mandate. The objectives that will support the achievement of e-RA are:

1. To formulate a taxonomy of organisational, human, and technical interventions for successful eReverse Auctions
2. To develop cause-effect models that relate to buyer-supplier relationships derived from the taxonomy developed in 1 and their effects (third, fourth, and higher order)

3. To generate a portfolio of cause-effect animation scenarios using system dynamic modelling together with supporting interfaces
4. To deliver and evaluate a simulation workbench that is populated by a library of simulation models that *demonstrate the impact of different e-RA strategies* in support of e-government

The EeRA research will be experimental with embedded evaluation resulting in good practice that can be disseminated; it will in effect promote *inclusion by design*.

Traditional e-RA processes comprise of four key stages; opportunity assessment, market making, transaction, and implementation, which are fully recordable for issues of traceability and transparency. E-RA can be quick to instigate, have a potentially low entry cost, and encourage good procurement practice. While e-RAs are not necessarily indications of procurement excellence, they can be a catalyst to support the introduction and continued operation of best practice and benchmarking. Arrowsmith (2002) argues that e-RA should take place in the context of good procurement practice and EU procurement rules, therefore harmonising practice across Europe. A reduction in the purchase price of goods and/or services is the main component of a business case for the use of e-RA, especially given the Best Value initiative used within the public sector. Such a reduction in cost can occur in real time through competitive bidding between suppliers, in a similar way to eBay through peer-to-peer models. This can be through improved pricing terms for spot purchase, or for the duration of the contract for longer term strategic agreements. It is not always, however, true that the cheapest price is the best deal. Factors other than price need to be considered, such as quality, delivery, product warranty, service, and specification.

While many e-RA are used as price reduction strategies, only such an approach can use a blended weight bidding format for combinations of these criteria, thus ensuring that the best value (as determined by the purchaser) is attained. Effectively, the e-RA process, which is clearly dynamic, provides reassurance that the organisation is buying at market rates rather than using traditional static tendering processes. Indeed, it has been argued by Beall et al. (2003), that e-RA should be centrally managed with strong leadership to ensure effective choice and to realise the maximum levels of benefits through effective management of the people and process challenges.

The investigators proposing e-RA have found from their previous research that the notion of 'success' or 'failure' within the context of IS project is primarily attributable to the extent to which services meet user expectations. This underlines the significance of both the technology and 'soft' human and organisational issues involved in IS evaluation (Irani, Ezingeard, Grieve, & Race, 1999; Remenyi et al., 2000). Consequently, there is a need for a research methodology that involves and enfranchises both the organisation and its senior staff. Simulation models develop deeper understanding of complex systems not simply by inspection of the results but through direct participation in the process of model construction and experimentation. The models provide an opportunity to explore and enhance the decision makers' understanding about decision options, identify relevant factors, and to establish how they affect strategic, tactical, or operational decisions. To achieve this, technology now supports visual toolsets that interface with the decision maker, not the simulation or software specialist, therefore increasing the accessibility of such decision aids. Therefore, there is a need to develop appropriate visualisation components and to provide a library of models or templates appropriate. Figure 1 below represents the methodology proposed by the investigative team, and mixes a combination of qualitative and quantitative approaches, set against phased research. These approached include research design, data collection and model building and, data analysis and evaluation.

The immediate beneficiaries of the e-RA project will be local governments. At present, their divisions are exposed to significant public and political pressures as the provision of ICT functions permeate services (West, 2004). Although the 100% accessibility target for 2005 appears at an end point, from other perspectives it is modest. Other central and political objectives will drive further changes within the local government sector (Evans, 2003). The evaluation tools from e-RA will assess and identify good practice to inform and improve the change process in the future.

CONCLUSION

The case research described in this article proposes a detailed, achievable, and valid approach to evaluating the complex issues associated with e-RAs. Additional authoritative research reports inherent adverse consequences through the electronic transactions involved. The EeRA investigation will analyse these situations in the context of local government, and propose a set of fundamental business scenarios to enable more effective decision making within the e-procurement process.

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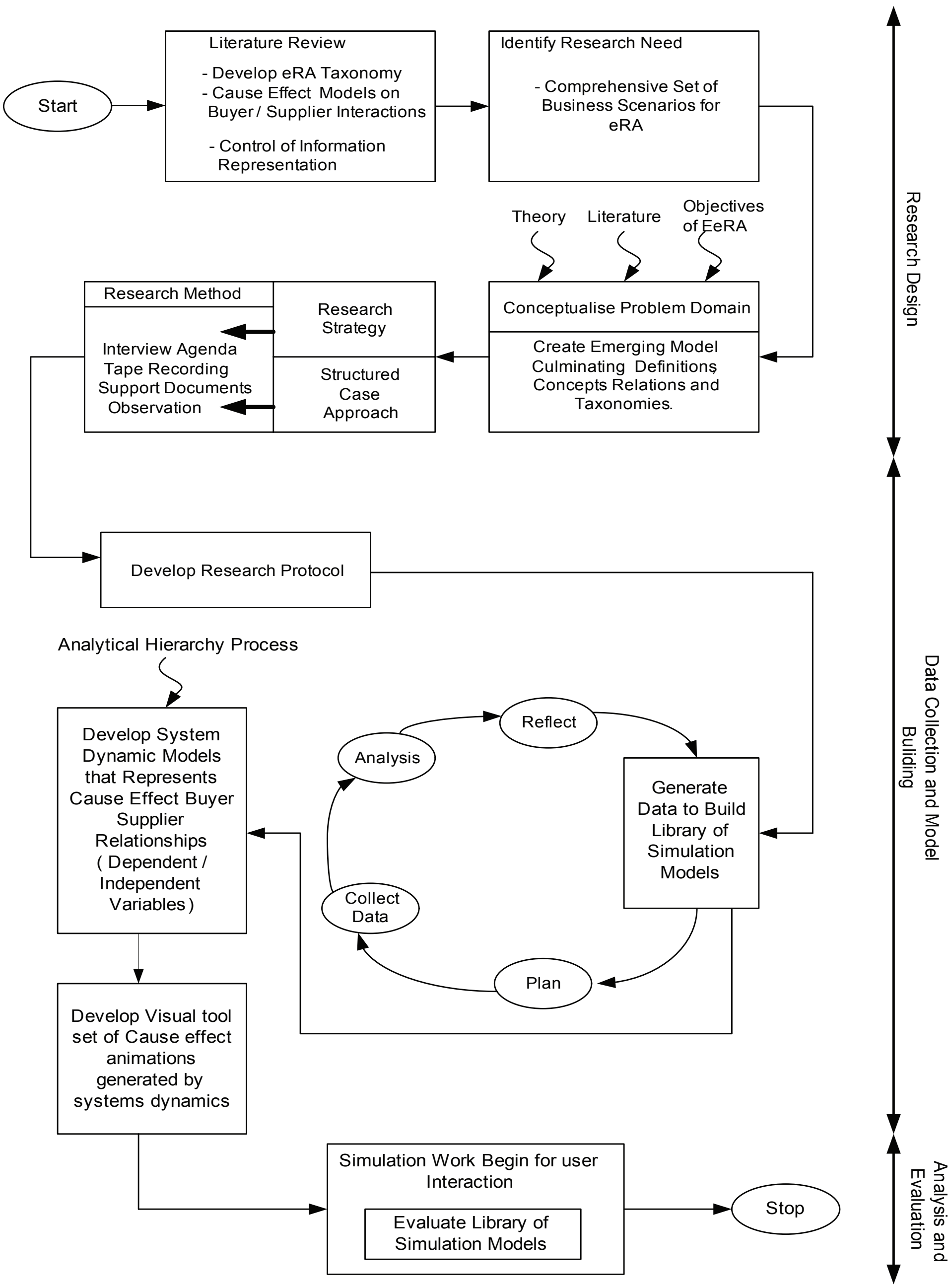
Figure 1. Research methodology



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Essential Additional Reading:

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Professor Koh has been a consultant for many Small and Medium sized Enterprises (SMEs) and large-scale manufacturing and service enterprises in the UK and abroad, in information and production systems operations, management and implementation. She is keen on knowledge transfer and examples of the projects include facilitating management development programme, developing relational database for material cutting optimisation, managing and implementing MRP/MRPII/ERP systems, and optimising supply chains. Her industrial and research experiences include implementation and operations of MRP/MRPII/ERP systems in SMEs, batch-manufacturing and high-tech environments, directorships/leaderships in agricultural sector, directorships and management in business to business and business to consumer food supply chain, business venture and investment.

Stuart.Maguire.has worked in several private and public sector organisations as an analyst/programmer, systems analyst and systems consultant. He has undertaken research and consultancy in over 150 organisations. Previously, he was a Teaching Company Supervisor within a multinational organisation as part of a large Teaching Company Scheme (now Knowledge Transfer Programme). In the 1990s he was a national academic co-ordinator for the Health & Social Services Management Programme. He has also developed and delivered executive development programmes for middle and senior managers in areas such as consultancy and project management.

Stuart has gained three separate degrees culminating in a PhD in Systems from Lancaster University. He also has qualifications in management, supervisory management, systems analysis and systems design. He is a member of the British Academy of Management and the United Kingdom Systems Society. He is also course director for the new M.Sc. in Management at Sheffield University.

Recently he has provided professional assistance on several national and international projects. Maintaining links with private and public sector organisations is valued highly and recent links with Ford Motor Co. plc, BT and the National Health Service have led to further opportunities to develop learning and teaching within the Management School. To complement this several recent research projects focused on small and medium-sized enterprises (SMEs) have revealed many key issues in business and management concerning firms in the 21st century.

Stuart has formulated his own methodology (OASES) for introducing information systems into organisations. This was developed in a number of large enterprises. He is particularly interested in how organisations attempt to manage change in turbulent business environments. He teaches the Management of Change on the MBA course at the University of Rouen. Stuart has recently focused on how organisations attempt to manage business intelligence at times of major change. Business Intelligence, and more especially, competitor intelligence, are major ingredients of successful business planning and control.

Stuart supervises a number of doctoral students in the areas of technology management, e-learning, and project management.

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