MANAGING TECHNOLOGY FOR BUSINESS VALUE

Stephen McLaughlin

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By

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Dedication

This book is dedicated to my wife, Mia, and family (both close and extended), who have always been supportive, and constructively critical of my ideas and work.

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Acknowledgement

I would like to take a moment to acknowledge all those students, fellow academics, and professionals who have helped me to test and shape my ideas. Without their feedback, ideas, and arguments my view of the role technology plays in creating real business value would be greatly diminished.

About the Author

Dr Stephen McLaughlin has spent the last 15 years working in academia. He has been involved in the design and delivery of courses for undergraduate, postgraduate and executive education. Stephen's main area of research and teaching has been around how technology can be used to improve business value.

Prior to working in academia, Stephen had spent over 20 years working in management positions in both the public and private sectors. His last role prior to moving into academia was with IBM, where he worked on the optimisation of the core fulfilment and supply chain processes across EMEA.

As an academic, Stephen's research interests centre on enabling organizations to improve performance based on a better understanding of how to align their technology and business strategy. From a more pragmatic, action-orientated perspective Stephen has also led research for IBM in the areas of identifying knowledge and innovation barriers within complex organizations, and developing frameworks for assessing service innovation capability. Another key area of interest for Stephen is understanding and assessing the business value of technology in a knowledge economy.

Stephen has published on the subjects of information management, knowledge transfer, service science, and service innovation in numerous academic and professional journals, such as the *Journal of Knowledge Management*, the *Journal of Business Strategy*, the *International Journal of Knowledge Management*, and the *European Management Journal* to name but a few.

Stephen lives in Kilkenny, Ireland, with his wife and two sons.

Preface

This book is the culmination of over twenty years working with technology. As a young engineer I was fascinated with how technology could improve the way we work and communicate. Granted, at that time the internet was but a twinkle in Tim Berners-Lee's eye. However, even in the mid-1980s organizations were playing around with networking in order to connect computers and printers. In the mid-1980s life was much simpler, even if the technology was not. Then, as industry, government and academia started to wake up to the many potential benefits that technology could bring, we started to see an increasing, and blooming, variety of specialists working to increase the practical applications of computer technology. Technology was driving new areas of academic enquiry and professionalism, which in turn were increasing the rate of technology development. People and organizations were finding more uses for technology, and finding a way to connect and communicate with other users was becoming a key focus for all.

As I progressed through my career, I realised that whilst technology was complex in nature, it was not the main problem when it came to integrating it into an organization. The bottom line, based on my experience at the time, was that the technology usually worked, and it is people that tend to mess things up. Now I know I'm generalising here, but for me the real challenge in adopting technology is getting people to work with it, and in a way that benefits both the individual and the organization.

This revelation made me think quite differently about how we as individuals and organizations view technology. Do we engage with new technology or hold back? When is the right time to start using new technologies, and how do we assess the impact that new technologies will have on the way we live and work? This last point is of particular interest to me as many times I have seen organizations race to adopt new technology without any consideration as to how that technology would change the way they do business. One organization I know (a Fortune 500 company) raced to embrace internet technologies and implemented a plan to move most of its workforce into home offices and out of their main offices. This certainly helped to reduce the cost of renting and managing office space in many locations around the world. However, what the organization failed to realise, was that once employees spent more time away from the office their sense of loyalty and

commitment to the organization waned, which in turn started to impact employee retention. In many ways, the adoption of any technology that changes the way we interact with each other will have consequences.

Overall, the last ten years have seen significant, and disruptive changes across all spheres of life – changes that have largely been driven by advances in technology. Technology is influencing how we communicate with each other on a 24/7 basis, which has resulted in finding ourselves living in an "always-on" or "always connected" society. Yet, we don't really spend any time thinking about how the technology is changing the way we connect as human beings. This is a big issue as it is fundamental to every form of engagement – including how we use technology to connect in our professional as well as personal lives.

Technology is a Pandora's box that has opened the door to multiple opportunities. Not all approaches to how we use technology will result in a good experience – I'm sure we can all recount a time when we had to contact a call centre and ended up on the line much longer than anticipated. But conversely, technology has also provided game-changing improvements in areas such as surgery, communications, and online education to name but a few. However, and here's the point, in those areas where we see the greatest improvements, there has been a deliberate focus on how the technology has been aligned to the way people work, communicate, and collaborate. Adopting technology for the sake of just getting the latest technology is a risky proposition. Technology needs to be aligned to the organization in a way that is appropriate to, and supportive of the overall strategic objectives of the organization.

In essence, this book hopes to help the reader to better understand how to ensure the technology is providing real value for the organization. This I believe is the real challenge for organizations today – not what technology to implement, but why it should be implemented. It is the aim of this book to give the reader the skills to help them address this challenge.

Stephen McLaughlin (2019)

Chapter 1: Introduction

1.1 Introduction

Technology is changing the way organizations interact with the environment around them. Customers, suppliers, strategic partners, and internal users are re-shaping the way data and information are created and accessed, and how services and products are developed, delivered and consumed. There is no doubt that information (and knowledge) is the new currency for organizations looking to successfully compete in today's competitive marketplaces. Technology is driving both the supply and demand for data, and because of this, organizations now realise the increasingly important role technology has in terms of their ability to compete and succeed in today's world. No longer can technology simply be considered a cost to the organization. Organizations must consider how technology can help develop competitive advantage – be it through the innovative application of technology, supporting customer-centric business processes, speeding up new product development, or improving market awareness and meeting customer expectation through improved business analytics/intelligence. Technology is at the heart of just about all our core business processes. Therefore, a failure to understand how technology can influence operational capability can result in business processes, and capabilities becoming inflexible and unresponsive. In a time of extreme competitiveness, many organizations may not survive if they cannot effectively employ technology to react quickly enough to new market challenges.

This raises another issue for the modern organization. The application of technology is no longer the sole responsibility of the IT function, but is a core management capability; just like HR, Strategy, Operations, Finance, Project/Programme Management and Marketing. There will always be a requirement for specialists within each of these areas. However, anyone in a leadership position, where they are expected to make business decisions, must have a sound understanding of each of these business functions. This is vital if the decisions being made are to have a strong focus on developing "business value" for the overall organization. Having a CEO who doesn't understand what a P&L statement is, or the need for demand planning and forecasting is unthinkable – Why then is it acceptable for the CEO not to

understand the importance of data quality, cyber-security, or the potential impact of technology on organizational culture and customer retention?

Due to the rate of change of technology there will continue to be a need for technology specialists. However, we must ensure that core business decisions are not abdicated to the CIO due to a lack of technological understanding by other business leaders. The application of technology may have an impact on work practices and structures, information and knowledge creation and sharing, information security (brand reputation), product/service delivery quality, skills requirements and training for end users (including customers!). Therefore, the impact needs to be considered across the organization; the decision should not just be based on the attributes of the technology alone. Hence, this is a conversation that needs to be had at all levels of decision-making across the organization. However, in order to join the conversation individuals across the organization need to understand and speak the same language. This book will start to develop that capability for managers and professionals who are interested in better understanding the value of technology for their respective organizations. The focus of the book is centred on ensuring that **business value through technology enabled leadership** is at the heart of any technology implementations.

As such the chapters are grouped under five broad headings:

- **Developing a Customer-centric Perspective:** Understanding how technology can be used to develop sustainable customer relationships and, therefore, more value for both the business and customer.
- **Technology Alignment to Business Needs:** Ensuring the technology supports the ongoing needs of the organization.
- **Managing the Cultural Impact of Technology:** Understanding and managing the impact technology has on how employees and customers continue to interact with the organization.
- **Creating an Information-driven Organization:** Enabling the organization to better understand the competitive market through data access, analysis, and information driven decision-making.
- **Securing Information Assets:** Ensuring organizations understand the threats and possible opportunities technology is creating around access to business-critical data.

A sound understanding of each of these topic areas is vital for all decision-makers involved in using technology to develop their business offerings and/or capabilities.

1.2 Target audience

This book is aimed at students and business practitioners who want to understand the broader implications of technology on organizational strategy, structure, and operations. The reader does not need any prior IT or technical expertise. This book will focus on the way that technology and business interface, and the implications of running IT as a separate entity within the organization. This book is not simply directed at those working in "IT Service Industries" but at anyone interested in understanding how to better integrate technology into the fabric of their respective organizations in a way that allows them to develop responsive and flexible customer-orientated business processes. Each chapter assumes no prior knowledge of the topics discussed.

1.3 The aim of this book

This book is aimed at those wishing to better understand how technology is changing the way organizations operate and perform. Recent advances in technology (high speed internet, cloud computing, mobile technologies, and the access to and processing of large data sets) have changed the way technology is viewed in terms of its role in developing responsive and competitive organizations. Technology is no longer simply seen as a commodity or utility, but as an effective mechanism for building competitive capability and, therefore, competitive advantage. This book provides the opportunity for the reader to gain an understanding of the changing role of technology within a fast-moving service orientated business environment. The concepts covered in this book are delivered from a broad perspective that in turn is influenced by the need to develop customer-centric solutions. The book will look at the problems that today's organizations have in driving real "value" through the ways in which they engage with, and utilise, technology. The book is not designed to turn the reader into an IT Manager, or CIO-designate, but to help them understand how technology is introducing a level of complexity to organizations that if not fully understood can seriously impact their ability to compete on an

ongoing basis. Failure to understand the implications that technology brings in terms of business process, transformational change, security, work practices, governance, and competitive positioning may mean the difference between success and failure for the organization as a whole.

It is important to note that this is not a technical book. There are many excellent books available to tell you how to connect systems, write code, build databases, process data, etc., whereas this book is not about the "how to", but more about the "why". As you read through the different chapters it will become clear that this book will not provide you with a prescriptive list of what to do to create the ultimate, technology savvy company. However, what it will do is provide you with a number of options and points for consideration when aligning technology to the needs of your organization. The purpose of this book, after all, is to help you improve your decision-making ability, and become a more effective leader within your respective technology enabled environments.

1.4 How to use this book

This book has been written to help postgraduate students and professionals to better understand the complex relationship that technology has with organizational performance. Whilst it is expected that this book will be used to support a postgraduate course, each chapter has been developed as a stand-alone introduction to specific topics relating to technology and its influence and interaction within the organizational context. To that end the reader can dip in and out of the book without the need to sequentially work their way from the first to the last chapter.

1.5 The structure of the book

This book takes the concept of technology driven business value and breaks it down into five key areas (Figure 1.1). Each area will then be addressed across the different chapters within the book. As you'll see from the diagram in Figure 1.1, different chapters will touch on the different areas at different times. This is deliberate on my part as I want to get across the multi-disciplined aspect of how technology impacts across all aspects of an organization. The structure of this book is designed to develop a business-

centric view of technology for all key decision-makers, and show how technology can be used to deliver business value across the organization.

As stated before, the objective of this book is not to develop a specialist view of technology for any one area of the organization (marketing, finance, operations, etc.) but to give the reader a more holistic view of technology's role in organizational performance, and how the reader can start to contribute proactively in making technology an agent for successful, competitive change within their respective organizations.

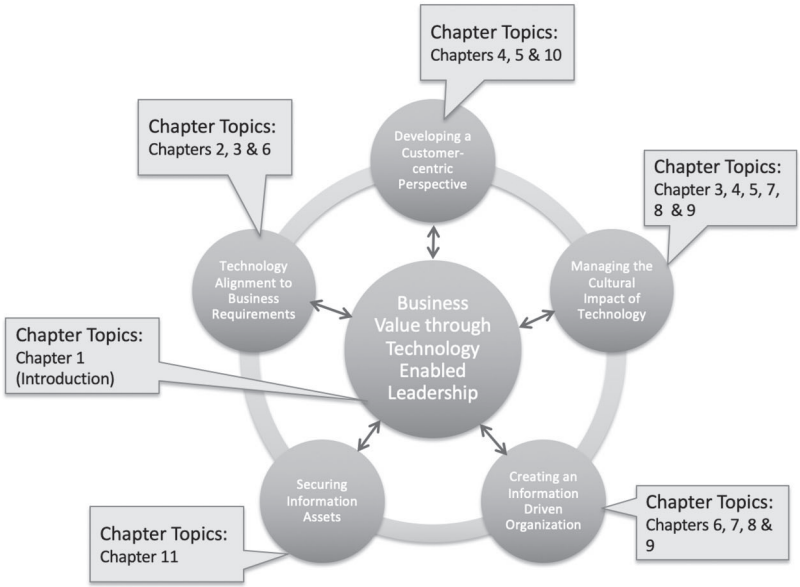

Figure 1.1: Book and Chapter Structure

The chapters identified in the figure above are explained in more detail in the **Chapter Breakdown** section as follows:

1.6 Chapter breakdown

The book contains 11 chapters and a short overview of each chapter is provided below:

1. **Introduction:**
   This gives an overview of the book. The intent is to develop an integrated view of technology with the organization. The role that technology plays is vital to organizational survival and, therefore, critical decisions concerning the adoption, sourcing, and purpose of technology-based solutions need to be assessed in terms of their impact on current and future organizational performance.

2. **IT and Business Strategy Alignment:**
   One of the key challenges facing senior management is the alignment of the IT strategy and the over-arching business strategy. This challenge is being aggravated by the increasing costs associated to IT enterprise-wide projects, the increasing time to delivery due to the complexity of the projects, and the increasing rate of change that organizations are experiencing within their respective competitive markets. The traditional relationship needs to be re-defined to one where both strategies are developed in unison. This chapter will look at three strategic options, and the impact of technology on Porter's five forces model.

3. **From IT to Digital: Assessing the Organizational Impact:**
   Traditionally, the provision, access to, and management of technology have been the remit of the IT function. However, with the advent of mobile technologies, social media, and cloud computing the demand for control in terms of the access and deployment of these technologies is moving from the IT function to other functions such as marketing, finance, operations, supply chain, etc. Coupled to this is the growing focus on data (both internally and externally generated) that are subtly shifting the focus away from technology and onto the nature of the data, or information itself. In effect, the working relation between technology and the various components of the organization is changing. The concept of "Digital" is much more than the notion of transformational technologies. It is about the shifting relationships, sense of ownership, and empowerment that come with the digital agenda. This chapter will look at the changing

relationship and role the IT function will need to provide to support a digital agenda, and what environmental factors will shape this agenda.

4. **Building a Digital Business Strategy:**
What is involved in developing a digital strategy and how does it differ from the more traditional IT strategy? In many ways, the digital strategy should address the issues of IT-Business strategy alignment. However, this new paradigm brings with it new ways of looking at how technology needs to be managed, and who now needs to be part of the development process. This chapter will identify how to look at the core components of what is meant by "digital" and how to assess their importance against the overall business strategy. The chapter will also look at methods for assessing the readiness of an organization for digital enablement, and what this will mean in terms of the impact that any proposed transformational changes will bring.

5. **From a Process-centric to Capability-centric organization:**
As technology is playing more and more of an influential role in all aspects of an organization's ability to plan, design, implement, and manage core processes and operations, understanding and developing IT based capabilities are becoming more vital. These IT influenced and influencing capabilities cannot be ignored. The potential to shape the organization's ability to respond in a timely and flexible manner can give the organization a competitive edge. Because of this the IT function can no longer be seen as simply a support function as there now exists a real and tangible opportunity to affect the way in which the organization senses and responds to changes in market forces and conditions. If organizations are to realise the potential of their digital resources then they need to develop capabilities around these resources. Organizations, by taking a capability-view, can better assess those resources that are critical to their key strategic objectives. What this chapter will do is demonstrate how to identify core capabilities, measure their impact and then put in place a development plan to improve capability performance.

6. **IT Governance and Risk Management:**
Organizations find themselves in the challenging situation where they have to keep the technology relevant and in line with the

business need whilst maintaining a high level of service through regular periods of transformational change. Ensuring the decisions impacted by technology are made in an informed and objective manner, and for the overall benefit of the organization, is vitally important. Those who have responsibility to make decisions relating to changing the technology alignment and profile of the organization need to be clearly identified. Many individuals will have opinions and views as to what needs to change, and how change needs to be implemented. However, the organization must ensure decisions are handled in a structured, accountable, transparent, and informed manner. As part of the decision-making process, key individuals must also be aware of, and able to assess, the potential of any risks inherent in changing the technology profile of the organization. Risk can never be fully removed from any change initiative, but through assessing certain risks options can be identified to reduce the probability of their potential impact. Because of this, structures and controls need to be put in place to ensure the right people are engaged, informed, and active in making the key decisions relating to how technology is employed throughout the organization. What this chapter will do is explain the reasons for IT governance, and how it links to the strategic purpose of the organization; what the structure of a governance framework would look like; and also, how to identify and assess potential risks.

7. **Using Technology to Support Knowledge Transfer and Innovation:**
   Knowledge manifests itself in different ways depending on where and when it is created within the organization. How an organization supports the creation and dissemination of knowledge will also differ depending on how that knowledge is intended to be accessed and shared. Tacit-to-tacit knowledge transfer very much supports the sharing of ideas and the innovation process, whereas the explicit to explicit process supports the manipulation and access of quality-controlled data. Technology will support these knowledge transfer activities in different ways. Therefore, organizations need to understand the types of knowledge transfer that are required, and the different ways of supporting them with technology. The type of knowledge being created and shared will also have an impact on an organization's ability to innovate. This chapter will look at the

links between information, knowledge, and innovation and the role technology plays in their successful formation and management.

8. **Information Systems: Shaping the Organization:**
This chapter looks at the impact that technology based transformational change can have on an organization's culture, politics, and structures. Does the changing technology landscape align with current culture? How can an organization assess the potential impact before making the investment? Also, how do individuals within the organization see the information they create and access: who do they see as "owning" this information and what does this mean to the organization as a whole when it comes to sharing and accessing this information? The chapter will also show how, through growing access to third party data sources, organizations are shifting their focus from the technology itself to what the technology can do by way of information creation, access, and analysis. This chapter will also look at what exactly an information-driven organization is versus a technology-driven organization. It will then highlight the implications of choosing one type over the other, and where both types can co-exist within one organization.

9. **Using Technology to Enhance the Customer Experience:**
As organizations use technology to interact with their customers the "user" experience becomes important. So much so that in many cases the quality of the user interface can impact the customer's decision to repeat the interaction process, irrespective of the quality of the product or service being accessed. Because of the importance that the customer experience can have on repeat business, getting the interface right becomes very important. Success at this point is not just dependent on the quality of your technical people, but on the manner in which end users (internal and external) are integrated into the development process. This chapter will look at the basic underlying principles and methods (and barriers) for building end-user feedback into systems development.

10. **Using Information Systems to re-think Business Processes:**
This chapter is about how technology can be used to improve business process development. Some advocates of process redesign take a mechanistic approach, viewing it more as a

technical task rather than as a socio-technical one. A focus on information technology as a key aspect of process design, while important, can be overemphasised. The central theme of this chapter is to highlight the need to extend the mutual interaction between information systems and process redesign, to include the interaction of people. To this end, the effective use of information systems to redesign processes depends on understanding and managing a range of socio-technical interactions, and not just on viewing the redesign from a purely technical perspective. Many process innovators believe that such projects must be conducted from the top down, but this opinion can be challenged. The detailed understanding of process design and customers often resides with those employees operating in customer-facing positions, and who are likely to resist attempts by others to redefine their jobs.

11. **Securing Your Information in a World of Open Access:**
One of, if not *the* most important asset for any organization is its data. Whether it is customer data, financial data, performance data, or data relating to intellectual property – this is a core resource for the knowledge-based organization. Where these data reside, who manages them, who has access to them, and how unique they are, are important questions for the organization. Recent advances in technology have seen the physical and virtual barriers to data being eroded. Employees and customers demand more transparent access to information, which needs to be managed. This ever-increasing complexity is requiring organizations, in many cases, to make the choice between speed of access, and information security. This chapter will look at how to protect the integrity, confidentiality, and availability of data, and at basic security practices for ensuring the organization's information remains secure, but accessible to the right individuals.

1.7 Intended learning outcomes

As you work through this book it is hoped that you will develop a sound understanding of how technology is shaping the way we interact with others, both internal and external to our organizational boundaries. The scope of this book is wide. However, the concepts are all inter-related, and through developing a high level and broad view of the subject a deeper

understanding can be attained. Overall, the intended learning outcomes for those reading this book are to enable them to…

- Define an organization's capability in terms of its current and future technology requirements.
- Identify the core components of a digital business strategy.
- Identify how organizations can stay in step with the rate of change within the technology sector.
- Identify common themes in technology development (notably digital technologies) and how these are changing the dynamics of internal and external relationships.
- Identify how emergent technologies can benefit an organization's end-to-end performance in terms of driving innovation, co-creation of value, and knowledge creation.
- Identify within an organization where, and what type of knowledge transfer is needed based on operational imperatives, and how technology can impact the transfer.
- Develop an awareness and understanding of the project and programme management techniques used to develop technology driven processes in support of core business objectives.
- Develop an appreciation of the different methodologies associated with the design and implementation of IT and Information Systems.

As we progress through each of the chapters a more refined and chapter-specific set of learning outcomes will be highlighted.

1.8 Reflecting on the content

Within each chapter there are a number of "Time Outs". These are reflection points designed to help the reader consider how some of the discussed concepts relate to realistic scenarios. These Time Outs are designed to get the reader thinking by posing a number of questions. There are no "right" or "wrong" answers to these scenarios, and the reader is encouraged to find an appropriate answer to the questions asked.

There are also multi-choice questions, true & false questions, and a case study at the end of each chapter to help consolidate the main learning points.

Chapter 2: IS Strategy and Business Strategy Alignment

Learning Objectives

By the end of this chapter you will be able to:

- Describe and explain the strategic role of information systems (IS).
- Explain what an information management strategy is and its core components.
- Describe the main difference between IS, IM, IT, and KM strategies.
- Explain how IS can support the competitive positioning of an organization.
- Explain how IS can help build competitive advantage for an organization.
- Explain how IS and business strategies can become misaligned and the potential impact this may have on competitive positioning.
- Describe how IS can contribute to building business value.
- Identify who is responsible for the development and implementation of IS strategy within the organization.

2.1 Introduction

Technology is pervasive across all aspects of today's modern organization. We use it to power our business processes, communications, product design and development, manufacturing, logistics, sales, marketing, financial and payment systems. As such, technology has become an integral part of how we run our organizations. As we grow to depend more and more on technology our needs become more complex. Gone are the days when technology purely fulfilled a support function for the business. Now technology is being used to build more interactive and intuitive ways of connecting with customers and internal users. It can help speed up and remove error from customer transactions, and scale with minimum ease from hundreds to thousands to millions of transactions instantaneously – with little or no need for an additional resource to meet demand. Technology can also help demand planning and forecasting in order to maintain an

optimised supply network. In essence, technology supports and enables every aspect of organizational performance.

However, the way in which we interweave technology throughout the organization requires complex solutions that can take time and significant funding to implement. Because of this, these technology solutions, or Information Solutions (IS) need to be planned and understood in terms of their impact on existing processes, work practices and methods of customer/end-user engagement. Technology changes the way people interact with the organizations, and how work gets done, and more importantly by whom it gets done.

Therefore, when an organization is considering its overall strategy it must consider how it intends to engage with technology to achieve its strategic objectives. In effect, the organization needs to assess and understand the gap between what technology can deliver and what the organization needs in order to achieve its strategic objectives. The organization must be able to answer the following questions:

- How will the existing Information Systems support the strategic plan?
- What changes to the existing Information Systems are necessary to support the strategic plan?
- What resources do we have/need to support the overall strategic plan?

Considering the speed of change being experienced by today's organizations, and the increasing capital costs and relatively long lead development times associated with IS implementations, the management of an organization's information systems cannot be an un-planned reactive activity. It needs to be fully aligned and in step with the organization's overall strategy.

2.1.1 IM, ISM, or KM – What's the Difference?

Information Management, Information Systems Management, or Knowledge Management – is there a difference, or is this simply an example of interchangeable terminology? It's worth taking a moment to differentiate between them.

Information Management is the collection and management of information from one or more sources and the distribution of that information to one or more interested parties. This includes the formatting, processing, access control, usage and evaluation of information across the organization. Information Management is a term that pre-dates the mass adoption of technology, and through the 1970s the term IM mainly related to file management, file maintenance, and records management – all largely focused on paper-based documents.

The 1970s saw a sharp growth in the number of computers being used within organizations. This resulted in an increase in the amount of documentation being created, accessed and stored electronically as well as physically. No longer was IM a job that could be done by anyone. Now an understanding of technology was required. Data were being created and sourced from spreadsheets, databases and text-based documents. As well as this, information storage was shifting from physical to virtual locations.

By the 1990s, information management no longer simply encompassed files and documents, but also the networks, computers, and storage devices necessary to create, share, store, and transport electronic documents and files. With a need for a deeper understanding of how technology supports the creation, control, storage, transfer, and maintenance of the data contained within its systems, IM has grown to encompass aspects of data management. This takes a more granular view of how data need to be structured (meta data) so they can be better utilised in terms of:

- **Time**: How can data be organised and accessed in the quickest way possible?
- **Quality:** How can we ensure data quality is as high as possible?
- **Cost:** How can we acquire, store, and access data in the most cost-efficient manner?

An **Information System** takes a broader view of how information is managed around an organization. Information systems tend to encompass technology, people, and the processes used to manage and manipulate information. Although there are similarities between IM and an IS, it is helpful to consider that IM is focused on the management of information in terms of time, quality, and cost. Whereas, an Information System approach is also focused on the processing of information within organizations, but the key focus is not specifically time, quality and cost in terms of

data/information management, but the improvement of decision-making, and the improvement of core business processes across the organization.

It is also worth noting a third component in influencing information-based decision-making across an organization. **Knowledge Management** is an important capability for organizations. Although many authors seem to confuse "knowledge" and "information", there still seems to be an understanding as to the importance of human interaction, and our cognitive thought processes, over IT solutions when it comes to solving new and unique problems. It is worth introducing the concept of explicit and tacit knowledge at this point. It is important because this concept lies at the heart of whether knowledge can actually be "managed" or not.

- **Tacit knowledge**: Polanyi (1958) identified tacit knowledge as a key component of knowledge. The interesting point is that tacit means "hidden" and it is developed through an individual's cognitive knowledge generating processes, that in turn are influenced by their beliefs, experiences, understanding of the context, their values and expert insight (Davenport & Prusak, 1998).
- **Explicit Knowledge**: This term is used to cover anything that is not "tacit", or hidden in nature. This is knowledge that is freely available, or can be accessed by the target audience.

From an overall perspective, the management of an individual's own thought processes (tacit knowledge) is not practical. However, the environment in which the individual works, collaborates, or interacts can be engineered to maximise the probability that the individuals concerned will draw the same knowledge conclusions relating to shared information.

From an "explicit knowledge" perspective, this relates more to the management of information than it does knowledge. This view is supported by current literature that refers to IT systems and network strategies when talking about explicit knowledge management. Therefore, the term "knowledge management" is by no means accurate, and can be construed as being misleading in the very nature of what it proposes to do. Sveiby (2001), who wrote the first book on the subject in 1990, ("*Kunskapledning*"), takes the following position:

I don't believe knowledge can be managed. Knowledge Management is a poor term, but we are stuck with it, I suppose. Knowledge Focus or Knowledge Creation (Nonaka) are better terms, because they describe a

mind-set, which sees knowledge as an activity not an object…this is a human vision, not a technological one. (Sveiby, 2001)

That said, the identification and management of an organization's intangible assets are important in maintaining a competitive edge within the global market place, and the term knowledge management has been coined and is in popular use. The problem is that organizations are being misguided by the term. Knowledge management is not about managing tacit knowledge, as this cannot be done through the use of software or hardware solutions. Nor can explicit knowledge be managed, because explicit knowledge is not knowledge, but relevant information. From a review of the current literature on knowledge management, and an understanding of what the actual concepts involve, the following definition of knowledge management can be used:

Knowledge management refers to the effective management of communication and information flows, and environmental conditions, that will facilitate shared contextual understanding, experiences, and beliefs within a motivated organization. (McLaughlin *et al.*, 2006)

Therefore, as Sveiby (2001) and Wilson (2002) point out, the term knowledge management is not ideally suited to the task in hand; we will continue to use the term but will apply the definition as highlighted above by McLaughlin *et al* (2006) throughout this chapter.

From a practical perspective, KM is concerned with the development of an environment conducive to the creation and sharing of knowledge assets. It will achieve this through the application of technology, work design, and cultural change. (The concept of knowledge and knowledge management will be covered in more detail in Chapter 7.)

The three management approaches are not contradictory or in conflict with one another. Most organizations will find they need a combination of all three approaches to manage their information and decision-making requirements. However, these approaches need to be coordinated and developed in sync with each other. It is important that they are not developed separately as there will be a resource overhead in managing each strategy initiative separately. The market in which an organization operates, and its culture will determine which of the three management approaches will dominate. For example:

Industry	Dominant Focus	Description
Publishing	IM	Information and content management are core to the successful production of books, magazines, papers, etc. Data and information quality are central to overall product quality.
Manufacturing	IS	Manufacturing efficiencies and effectiveness are dependent on integrated ERP/Fulfilment systems to ensure the scalable flow of data between automated supply chain processes.
Service (Consulting)	KM	Developing a reflective/learning organization that can respond to new/unique situations effectively through interpersonal knowledge creation and sharing.
Telecommunications	IS	Develop technology solutions to provide accessible communication/digital media/internet for end-customers. More concerned with the transfer/storage of content then the creation of it.

Table 2.1: Examples of Strategic Focus

Although Table 2.1 gives an example of how certain industries might favour one management approach over the others, in practical terms many organizations will apply different approaches even within their own organizations. For example, Health Care will use different approaches internally. For patient care record management, IM is probably more important than IS management. Whereas, for the sharing of "best practices" amongst clinical staff, KM will need to play a more prominent and defining role.

IM and KM strategy will be covered in more detail in Chapters 7 and 8; however, the approach in terms of strategy development will be covered in this chapter, as it is relatively standard for all forms of strategy development.

This chapter will focus on the need for, and development of, an Information Systems management strategy.

It is important to note that we have not mentioned the concept of IT strategy. As Chaffey and White (2001) point out, this is because IT strategy is usually involved not in strategy formulation, but rather in planning the deployment of the technology infrastructure and architecture to achieve the strategic objectives of ISM, IM, and KM.

2.1.2 Why is an Information Systems Strategy Needed?

Information is the "life blood" of the modern organization. Therefore, how it is created, flows, is shared, stored, and secured is a key concern of any information system. As far back as 1992 (before the advent of commercial internet use) it was an accepted notion that two-thirds of managers got their information needs from face-to-face or phone conversations, with the remaining one-third of information being acquired from documents, most of which originated outside the organization (McKinnon & Burns, 1992). Technology has certainly changed how we communicate and has increased the amount of data available to managers today. However, at the heart of McKinnon and Burns' (1992) finding is the notion of trust. For people to accept and use data and information they need to trust their sources. Therefore, if an organization is to effectively use its data, and in turn the information derived from them, to build competitive advantage it needs to ensure that the data collected are relevant, accurate, and valid.

A definition of IS strategy that broadly covers the requirement highlighted above comes from Doherty *et al.* (1999).

The process of identifying a portfolio of computer-based applications to be implemented, that is both aligned with corporate strategy and has the ability to create an advantage over competitors. (Doherty *et al.*, 1999)

This definition shows that one outcome of IS strategy development is the identification of a suitable range of information management applications (that focus on the provision of relevant, accurate, and valid data) to achieve both business alignment and impact. However, as stated, it is a broad definition that does not consider the more specific task of collectively

managing information technology, the implementation of information systems and the over-arching requirement to manage information and data. Wilson (1998) covers this interdependency more explicitly.

An information systems strategy brings together the business aims of the company, an understanding of the information needed to support those aims, and the implementation of computer systems to provide that information. It is a design for the development of systems towards some future vision of the role information systems will play in the organization.
(Wilson, 1998)

At the core of this definition is the importance of information plans in helping an organization achieve its strategic objectives. The focus is not on the technology itself, but on the value that technology (computer systems in this case) brings to the organization as a whole. This can prove a challenge for many organizations where the focus of those responsible for delivering information systems subtly shifts from the "information" to the "technical" aspect of the systems. Ward and Peppard (2002) point out that the IS strategy should explicitly consider both "technical" and "informational" aspects of strategy formulation and they identify the following as key outputs of their IS strategy process:

Strategy Components	Key Outputs
IS/IT Management Strategy	An overall IS strategy for the organization, describing the current situation, vision and rationale for IS-related change and plans.
Business IS strategies	In larger organizations, these specify how each business unit will use IS/IT to deliver its business objectives. This will be defined at the level of the applications portfolio for the business and relevant information architectures.
IT Strategy	Policies for the management of specific hardware and software resources comprising the IT infrastructure. This usually also includes the provision of end-user support services such as the IT help-desk.

Table 2.2: Key Strategic Outputs

According to Earl (1996), the goals of any IS strategy are common for nearly all organizations. Earl (1996) suggests that an IS strategy should look to achieve the following:

1. Align investment in IS with business goals (objectives).
2. Exploit IT for competitive advantage.
3. Direct efficient and effective management of IS resources.
4. Develop technology usage policies and architectures.

These four goals are focused on improving competitive advantage and organizational performance. These are in fact fundamental to any strategy being developed irrespective of the business function; marketing, HR, sales, etc. As such, when developing the IS strategy, the organization must ask the same questions as it does for any other aspect of organizational strategic development:

Reflective Questions	Description
What are we doing now?	Understanding the gap between what we can do and what we need to do in terms of alignment with the overall strategy.
What should we be doing?	What do we need to do now to align with the current and future overall strategy?
How are we going to do what needs to be done?	What resources/technology do we need to make the transition necessary to align?
How are we going to make the changes?	Understanding what the impact of the transition will be on the organization, the people, and the culture across the organization.
How are we doing?	Ensuring a continual review of current versus planned strategy.

Table 2.3: Reflective Strategic Questions

Because of the size and cost of many technology implementations, organizations need to ensure such changes are aligned towards meeting the overall strategic objectives. Therefore, developing an aligned business/IS strategy is important, but it is also important to ensure the strategy is continually revisited and revised in line with the changing competitive environment. A failure to align the IS strategy with the overall business

strategy may result in the organization being unable to respond to changing situations in the market place, that in turn can result in lost opportunities and lost competitive advantage. Such a mis-alignment between the business and IS strategies may be something that proves disastrous for the organizations.

2.1.3 Information Systems as a Component of Competitive Advantage

Without doubt, the relatively inexpensive cost and ready access of technology, have strengthened the view that technology is now largely seen as a commodity, and that a certain level of technology is a prerequisite for anyone looking to start up and run a business (Wade *et al.*, 2011).

Certainly, with the introduction of basic spreadsheets and databases in the 1970s and 80s the ability to process orders, calculate invoices, track stock levels and apply basic forecasting algorithms gave businesses an advantage. However, as the price of technology came down it became more accessible and, therefore, the technology-driven advantage held by the few was quickly eroded.

As we know, technology is easily imitated, and quickly improved upon, with many suppliers providing imitation, or alternative technologies at competitive prices. The international standardisation of many of these technologies (SCSI, RAID, MP3, PDF, TCP/IP, DHCP, UPnP, VPN, HTTPS, VoIP6, HDMI, USB, Wi-Fi, etc.) has meant that organizations can quickly and easily move between different suppliers and products without seriously impacting their technology infrastructures. In fact, the standardisation, interoperability, availability, and cost of many hardware and software technologies have meant technology cannot, in itself, provide a significant level of sustainable competitive advantage to an organization.

However, that said, we are not so much interested in the technology as we are with what the technology can do for the organization. Therefore, the focus on Information Systems helps ensure technology is now viewed from the perspective of improving business value. If, as Earl (1996) suggests, IS investment needs to be aligned with business goals, then first the business objectives must be clearly understood. Recalling Wilson's (1998) definition of an Information System…

An information systems strategy brings together the business aims of the company, an understanding of the information needed to support those aims, and the implementation of computer systems to provide that information. It is a plan for the development of systems towards some future vision of the role information systems play in the organization.
(Wilson, 1998)

We see some key points in this definition that are important. They are:

1. The need to develop an understanding of the connected information needs of the organization.
2. An ability to provide the necessary information.
3. The development and alignment of resources to build information systems that are responsive to changing business or organizational needs.

With the focus clearly on developing information as a core organizational asset, and a clear understanding of the business objectives, an aligned IS strategy can start to build unique, and hard to replicate/imitate capabilities centred on information usage for the organization. With these points in mind, it becomes easier to see how technology can once again play an enabling role in building competitive advantage. It is in this way that Earl's (1996) second point, "Exploit IT for Competitive advantage" should be interpreted.

2.1.4 Focusing the IS strategy on Business Value

Every organization, irrespective of size or sector will approach the development of their strategy from a different perspective. This perspective will be influenced by a number of factors, such as:

- **Skills (Managerial/Technical):** What skills do the key decision-makers have in terms of business understanding, technical knowledge, and leadership ability?
- **Organizational culture:** What is the culture of the organization like? Does it support open collaboration between departments and business functions? Do department heads trust outsiders to contribute to the running of their business functions?

- **Path dependency:** The decisions that individuals have made in the past will inform the types of decisions that individuals will be expected to make in the future. In other words, "*we only expect IT people to make decisions about IT stuff, and the marketing people to make decisions about marketing stuff*".
- **Perceived value of Contribution:** How does the organization value the contribution of the different business and technical functions? Is technology simply seen as a utility type service where the technology is viewed as a necessary cost to the business such as electricity, water, and gas – but does not contribute towards competitive positioning?
- **Existing Technology Capability:** Is the organization starting with a clean sheet, or does it have legacy systems already in place? Are they new or old, and how are they currently aligned to support existing business processes?
- **Strategic/Business Shift:** Is the organization facing a significant change in the way it needs to engage with its customer base? Is it a case of fine-tuning existing business models or is a complete business transformation required?

The existence of these factors will shape the manner in which technology is viewed by the different parts of the business, and subsequently, how technology is expected to support the overall business strategy. Managing, and changing, these factors is not simply a job for the IT manager or Chief Information Office (CIO), but is a task for all key decision-makers across the organization. Senior management must realise the important role that technology plays in building competitive advantage. This is not a question of becoming more technology-aware, but developing a more integrated view of business-technology integration.

The Figure (2.1) helps to simplify the shift in perspective required by organizations now looking to use IS to support their business strategies.

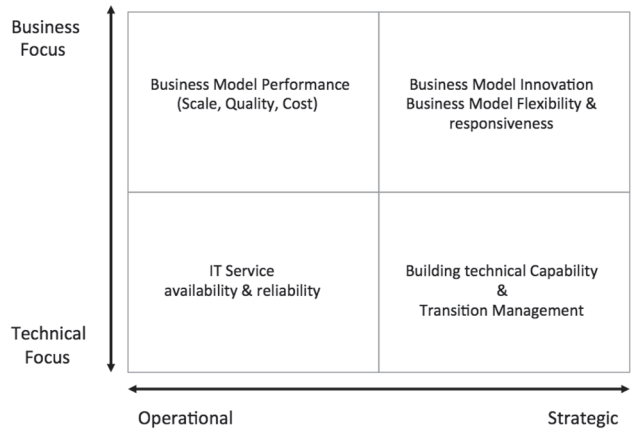

Figure 2.1: Technology Focus

Each of the quadrants identified in Figure 2.1 highlights an important activity where technology can help to support the operational performance of an organization. However, it is important to realise that for an organization to expect to drive real business value through the deployment of its technology, it must consider the activities in all four quadrants.

The "Business Model Innovation" quadrant represents a level of technology integration that provides the most business value. Here the focus is on how technology can be used to build and support innovative business models. The organization fully realises the value of technology and looks to the IT function as a key contributor in the development of the business strategy.

Time Out

Think about it: Strategy Alignment

David Singh has just taken over as CEO of Audio Solutions Ltd. The company produces audio equipment for the digital age…well, that's what the marketing material says anyway. The problem is that Audio Solutions' market share has been slipping dramatically over the last 24 months. They used to be the market leaders in MP3 and MP4 players but over the last 18

months they just don't seem to be able to capture the customer's changing needs, or build products that the customer now wants.

Ten years ago, Audio Solutions was the market leader in analogue and then digital sound system separates, and had a loyal following amongst high-end audio enthusiasts and music connoisseurs. Although they were the main provider of high-end audio equipment, that market was shrinking and they needed to think about diversifying. About four years ago they decided to use their knowledge of audio (analogue and digital) to develop a range of affordable MP3/4 players for the middle- to low-end of the market. Initially, many new customers switched to their more affordable range of players and for two years they saw their market share increase to a favourable 37% worldwide. This new market is far more competitive with many manufacturers developing similar MP3/4 products.

However, as already mentioned, two years ago the 37% market share started to shrink. Now the market share stands at 18%, representing a significant drop in revenue, and more worryingly for Singh and his board of management, in reputation and loyalty. Carl Richter is responsible for customer satisfaction and he has just received the results from the latest customer and business partner survey. Carl presents the findings to the board, but the responses point to the same conclusions:

1) The build quality of Audio Solutions is excellent.
2) Audio Solutions seems slow to implement new technology/usability enhancements in their products.
3) Audio Solutions doesn't seem to listen to what their customers are saying they want.

Singh knows they have excellent manufacturing facilities that can scale to meet any changes in demand without impacting quality. He also knows that they are pitching their products at the right price point for the market, and Simone Porter (Head of Sales) is keen to reiterate that their products are very competitive when matched to similar products from a build quality and functionality perspective. However, it's just that the competition appears to be able to update and release their products faster to market than Audio Solutions can. Simone and Gene Kennedy (Head of Marketing) are keen to point out that when they compete with similar products, they are very competitive, it's just that everyone else seems to

be better at capturing customer needs and getting their products out to market.

Singh knows his team and workforce are committed to getting the company back on top. The question is where to start? Susan Day (CIO) is very competent technically, and will do whatever Singh asks of her and her team in terms of IT implementation, but he can't help wondering if Susan could be playing a more active part in solving this problem…

Questions:

- Do you think Audio Solutions is being well supported by its CIO and IT function?
- How do you think the IT function can be used to develop a more competitive product offering for the organization?
- It appears that information concerning customer requirements is not being captured, evaluated and transferred to the product design teams and manufacturing. How can the CIO help improve this situation?
- Is the solution to the above question purely a technical one?

2.2 Enabling Organizational Strategy through Information Systems

It's not hard to think of an example of an organization that has used technology to support its business, and build its competitive position. For example, FedEx has its tracking website, and Amazon has its online order management system. There's also eBay, Google, Facebook, and Netflix. But there are also more traditional organizations that have used technology to modernise their businesses. These would include companies such as Rolls-Royce, GM, SNCF (French National Railway), Wal-Mart, BNY Mellon, and Seven-eleven. The list goes on. Irrespective of the business, those organizations that are dependent on information to make improved and better business decisions need to develop strategies to identify, validate, collate, share, and store information.

In 2003 a polemic article titled “IT doesn’t matter” was published in the Harvard Business Review (Carr, 2003). In the article, Nicholas Carr argued that as technology becomes more pervasive it will become more standardised, accessible, and commonplace. Therefore, technology in itself can no longer be expected to give organizations a competitive edge. In a sense, Carr’s point was valid, and although Tapscott (2004) responded with an article highlighting the role technology has played in the development of successful organizations, both authors were arguing the same point: and that is, that technology alone will not make an organization great. If the organization is relying on technology alone to improve its competitive position then it will fail (Tapscott, 2004). On the other hand, organizations that have good business models and use technology to successfully support those business models tend be very successful overall.

Information systems are a necessary part of doing business. However, the information systems must be developed in tandem with the business models. Understanding the business and the role technology can play in building competitive capability is vital, and as such the development of an effective IS strategy, just like a successful business strategy, cannot be done in isolation, but as part of a collaborative multi-stakeholder endeavour.

2.2.1 Developing an IS Strategy

Developing an Information Systems strategy has a lot in common with the development of any other type of strategy, such as marketing, HR, corporate, sales, etc. In effect, the IS strategy broadly follows five key stages, and how the strategy is defined is dependent on how the organization (not just the IT function) approaches each stage. These stages are as follows:

Stage	Description	Consideration
1. Conduct Situation Analysis	Understand what is shaping the competitive environment. What are the internal and external factors, and resources available to the organization?	What is happening in our competitive environment and where are we in it?

2. Define Vision and Objectives	What do we want to achieve, and by when? Where do we see our organization in 1, 3, 5, 10 years' time?	Where do we want to be in so many months/years/decades?
3. Develop Strategy	How do we achieve our goals and objectives? What do we need in terms of resources and how do we need to use them? What capabilities do we need to develop?	How do we plan on achieving our goals and objectives? Are they even realistic?
4. Implement Strategy	Working the plan. Setting targets and tracking progress towards them.	Decide how best to implement any necessary changes – and do it!
5. Review, Control & Correct	Understand what's working and what isn't. Is our strategy still relevant, or does it need refinement/changing? Put in place a structure to manage and monitor the strategy implementation.	Are the changes working? What do we need to do to make our strategy work? Is the strategy still relevant, or does it need to change?

Table 2.4: Considerations in Developing a Strategy

Included in Table 2.4 above is a set of questions that the organization should continue to ask itself in order to ensure the development of a relevant and effective strategy. Once again, these questions are not unique to just IS but should be asked irrespective of the type of strategy being developed.

2.2.2 The Strategy Process

If an IS strategy development is to be effective, organizations must first create an effective development process. The output of the process will be an IS strategy that is aligned to the overall organizational strategy. As highlighted in Table 2.4, there are broadly five stages in developing a strategy. These stages will in turn be refined and modified to fit with how

the individual organizations go about their planning activities. However, the stages should still be recognised throughout the individual process.

As well as adhering to the five stages (Table 2.4) an effective IS strategy should also exhibit four basic characteristics; irrespective of the industry the organization operates in, or the competitive nature of their operating environment (Chaffey & White, 2011). These characteristics are:

- **Maintain alignment between the IS and the Business Strategy**: If misalignment occurs then no matter how elegant the IS or Business strategy the organization as a whole will fail to achieve its desired objectives.
- **Keeping it simple:** Understandably, technology brings with it a degree of complexity. However, one must keep in mind that the simpler the solution, the easier it is to communicate, implement, and manage. Therefore, the IS strategy should be clear in its intent, easy to understand in terms of its implementation, and benefit the business as a whole.
- **Continuous review:** The development of a strategy is not something you do once and then implement. The impact of a strategy will change the competitive environment, and, therefore, change the initial assumptions used to define the first instance of the strategy. To that end, the strategy needs to be constantly monitored and modified in order to keep it relevant.
- **Built in flexibility and responsiveness:** The strategy must also be flexible enough to respond to changes being generated by the business. Failure to do so may result in a missed commercial opportunity that the organization may not be able to recover from.

All of these characteristics will present their own challenges and various stages of the IS strategy development and implementation. However, the last characteristic concerning flexibility and responsiveness is very much related to the rate of change of the competitive environment being experienced by the business as a whole. Therefore, within a highly dynamic and changeable environment the implementation of significant corporate-wide technologies (such as an ERP, CRM, or data management/warehousing system) can introduce time constraints that are going to be difficult or unacceptable for the organization. Therefore, the developers of an IS strategy must be in tune with what the business is experiencing. The development of an IS strategy is not simply a road map for the deployment of technology, but a clear and informed road map for how technology will

help the organization with respect to its particular strategic objectives in an appropriate and constructive manner.

2.2.3 Planned versus Emergent Strategies

The development of an IS strategy should be a continuous process. Organizations need to keep appraising the opportunities and threats that come and go within their chosen markets, and identifying, developing, and re-aligning their resources to meet any new challenges and opportunities for improved competitive advantage. It is a common belief that managers engaged with the strategy development process will follow a consciously planned strategy. This is true, broadly speaking, but it does not reflect the process of refinement that most strategic plans go through. The organization is constantly being influenced by environmental factors such as increased competition, changes to trading regulations, environmental legislations, skills availability, and even natural disasters. This means that many intended strategies need to be re-evaluated or even terminated based on the changing nature of the operating environment.

Mintzberg *et al.* (2003) explain this process through the concept of an "Emergent Strategy". This is where the organization has a high-level view of its strategic objectives, but fine-tunes the actual strategic plan based on how it needs to respond to short-term environmental factors. Through this process key strategic initiatives can be fine-tuned, or rejected if deemed unnecessary. This emergent approach gives the organization a chance to react to uncertainty, to experiment, and to increase levels of participation in strategy formulation from across the organization.

The emergent approach also helps to ensure the strategy remains relevant, realistic, and achievable. Should the organization follow a rigidly planned strategy it may end up driving towards a position within a market that has moved on, or may no longer exist.

Conversely, an organization needs to maintain a high-level vision of where it intends to be over the short, medium, and long term. Without this vision it will just react to environmental forces without a broader, shared view of where the organization is trying to get to. This in turn will simply result in the organization becoming reactive and unfocused.

Mintzberg *et al.* (2003) articulates the relationship between a planned and an emergent strategy very clearly in Figure 2.2 below.

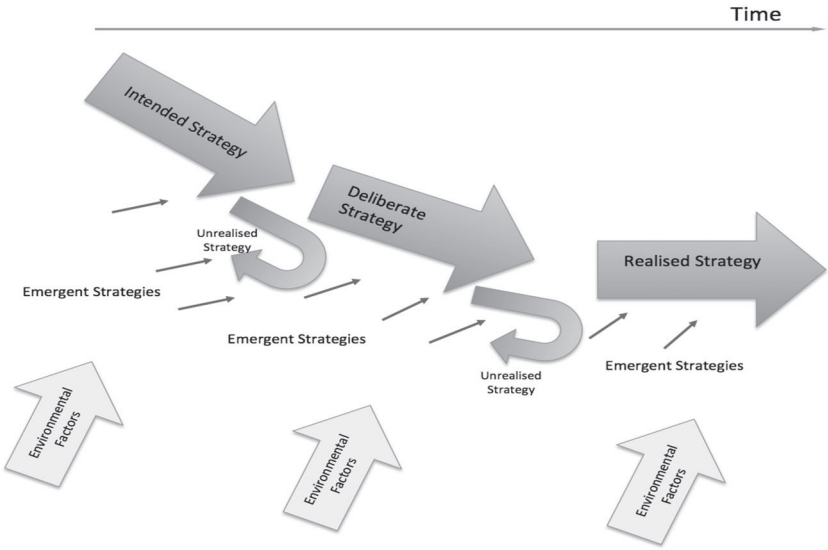

Figure 2.2: Deliberate and Emergent Strategies (modified from Mintzberg *et al.,* 2003)

There are a few points worth noting from the diagram in Figure 2.2. The "Intended Strategy" is the initial starting point for the organization's strategy. As environmental factors start to influence the organization, the intended strategy will be fine-tuned and certain aspects of the strategy may be rejected (an Unrealised Strategy). This will result in what Mintzberg *et al.* (2003) refers to as a "**Deliberate Strategy**", that, with further fine-tuning, will ultimately lead to a "**Realised Strategy**".

The organization should start out with a broad plan or vision of where it wants to be, and what it wants to achieve. By continually testing this vision against the operating environment the organization will refine the overall vision into a workable, responsive strategy, that can then be implemented. However, this is not the end of the process. As long as environmental factors continue to change, organizations will need to continually review and fine-tune their strategies. Therefore, in Figure 2.2, once the organization has realised its strategy it will need to start the process all over again – redefining its vision, that in turn will start to shape an intended strategy. The

timeframe over which this process repeats will depend on the industry, but it could be anywhere from months to years to decades.

What is apparent is the need for a clear view of where the organization is going, and how its IS needs will support this journey. Coupled to this is the realisation that conditions will change over the coming months and years so the organization will need to continually monitor the operating environment, and fine-tune the overall strategic plan accordingly. For example, Google has a very clear long-term vision, but moves forward not by developing rigid strategic plans, but by responding to new opportunities, such as the purchase of YouTube.

2.2.4 Duration of an IS Strategy

Certain technologies and systems will require time to implement. Unfortunately, due to the dynamic and changeable nature of many competitive environments this might be time that the organization is unable to provide.

Thankfully, technology itself is providing a solution for the faster implementation of large-scale systems. With the advent of cloud-based services many organizations have been able to implement technologies such as ERP, CRM, HR pay-roll, Transaction Management, etc., without the need for long, and protracted implementations. As more services and applications become available via cloud-based services this has certainly reduced the challenge of moving to new organization-wide systems. Therefore, understanding the business environment becomes a necessary part of the development of the IS strategy. So, the question is "What duration should the strategy be based over?"

The answer to this will depend on the type of organization developing the strategy, and what the competitive environment is like. However, as a guideline, the IS strategy, in general, should not be any longer that the overall corporate, or business strategy. Where there is a requirement for certain aspects of the IS strategy to run past the time-scale of the business strategy it must be called out, and the impact on the business' ability to continue to react and respond to market forces must be communicated and understood. Examples where this might happen would be around the development of in-house systems that are not commercially available, the

transition of legacy technologies, or the continued dependency on, or need to comply with national standards in certain geographies (e.g. internet access, data management policies and regulations).

As the IS strategy must be in line with the overall corporate or business strategy, it is vitally important to continually reappraise, and refine the strategy in line with the progress of the IS implementation, the impact this is having on the business, and the business' ever-changing requirements. Because of this need for internal strategic alignment a long-term (3-5 year) IS strategic plan is not usually necessary, or practical. There may be elements, as discussed already, that need to be planned out to 3-5 years, but the core IS strategy should be developed with a 1-2-year time frame in mind.

Time Out

Think about it: Who needs to be in the loop?

Merrill, Bosworth, and Flynn (MBF) Ltd. is an international shipping company operating out of Singapore and Rotterdam. For the last 50 years it has been a competitive force in the world of freight shipping, managing a fleet of over 70 cargo ships ranging in size from 6000 to 120,000 tonnes. For many years the MBF strategy has been shaped by the time taken to build its ships. As some of the bigger ships can take up to 4 years to go from initial planning to being commissioned into service, the decision to build and the subsequent commitment to each build have meant the strategy has been kept fairly rigid for long periods of time. This was manageable for many years, but now manufacturers are looking to reduce the cost of transportation by moving their manufacturing capabilities into the countries where they are selling their end goods. This has significantly changed the demand for sea-based transportation. Anne Hynes (CEO) and the Senior Management Team (SMT) are now looking for a more flexible but cost-effective business model to support the changing needs of their main clients. So far, the more obvious option is to opt for a leasing model for their shipping fleet.

Anne is going to have an off-site brainstorming meeting to try and work out how to make the leasing model work for MBF Ltd. Anne wants to keep the team small and focused on coming out of the meeting with an initial

business model, so she has invited Mia Yeager (CFO), Simon Dunne (Ops and Shipping), Xi Wang (Sales), and Kevin Smith (HR) to the meeting. If this plan works, MBF Ltd. will see a lot of change in the way it utilises its shipping, hires and manages its personnel, commissions and decommissions ships, and responds to the changing demand for sea-freight shipping.

Anne is aware that they use a lot of technology to monitor their ships' progress, managing freight logistics, engine performance, and communications. Anne knows the CIO – Vic Timmins – is very good and technically competent, but does he need to be part of the brainstorming meeting? Or should Anne engage Vic and the rest of the management team once the initial leasing business model has been defined?

Questions:

- Do you think the CEO is right to exclude the CIO at this stage of the business model planning?
- Do you think the CIO can add anything to the discussion at the initial stage, and if so, what?
- How do you think technology can help improve the leasing model?
- Are there any technology issues that the SMT needs to consider that might adversely impact the way the leasing model is developed?

2.3 IS from a Strategic Perspective

Organizations fully realise the importance of their information systems, and few organizations would consider the purchase of technology purely to support back-office, or business-support functions. Technology has a leading, and active role to play in helping organizations realise their strategic objectives. Examples are all around us where organizations are coming up with ways to differentiate themselves and their products through their information systems. What makes these organizations different from the more traditional IT-enabled organizations, is their understanding of how

information, and not technology itself, can give them a competitive advantage.

Tesco in the UK has successfully used its information systems to better understand its customers' buying patterns through the introduction of its club card loyalty programme. This is a model that has now been followed by many other retailers, and although this has reduced the initial advantage it still provides Tesco and other organizations with a rich source of information on customer shopping preferences and patterns.

Examples also exist within the public sector. Universities are using their information systems to better track and communicate student performance, managing fees, and tracking attendances and satisfaction levels. The UK government is also developing better information systems for engaging with the public in order to provide 24-hour online access to information concerning health, policy, income tax, social security, etc.

For those organizations using their information systems to drive core strategic initiatives, the development of the information systems is not a technical issue. The focus is on what the systems will deliver for the organization; in effect they look at the value to the business or organization as a whole. As the customer is a central component to most organizations' strategy the IS strategy needs to deliver in a way that will enhance or improve the customer experience. According to Boddy *et al.* (2008), organizations should be looking at their information systems to see if they can achieve the following:

- Improve quality for customers.
- Reduce costs and work more efficiently.
- Differentiate products from services.
- Offer new or better products or services.
- Lock in suppliers or buyers.
- Raise barriers to market entrants.
- Improve employee satisfaction.

Boddy *et al.* (2008) contend that by continually asking these questions the organization can avoid managers being driven by the need to acquire the latest technology fads. A sense of strategic direction, they feel, provides a coherent context within which to discuss technology choices.

2.3.1 Sources of Competitive Advantage

How do organizations build competitive advantage within their respective markets? According to Porter (1985), "***an organization has competitive advantage whenever it has an edge over its rivals in attracting customers and defending against competitive forces***." Therefore, a sound understanding of the competitive environment is vital for developing and maintaining any form of competitive advantage or positioning.

There are many ways that an organization can develop a competitive advantage, and we must accept that technology can contribute significantly in building and maintaining these advantages. Valacich & Schneider (2012) identify seven sources of competitive advantage as follows:

- **Quality** (e.g. Toyota, Rolex)
- **Service** (e.g. IBM, Goldman Sachs)
- **Low Cost leadership** (e.g. Wal-Mart, Ryanair)
- **Proprietary** (e.g. Coca-Cola, Microsoft)
- **Innovation** (e.g. Apple, Honda)
- **Brand** (e.g. Nike, Guinness)
- **Value** (e.g. Nintendo, P&O Ferries)

There are a few important considerations to note when deciding on, and then developing the source of competitive advantage.

1. **Is the source what the market is looking for?** Are your customers looking for a low-cost solution to their needs? If so, then developing a high-quality product, that may be more expensive may not be commercially viable.
2. **Can the source be developed in a sustainable way?** Can you develop a source of competitive advantage that you can sustain, or will you end up pricing your own product out of the market?
3. **How unique can you make your source?** How can you make your products/services stand out from the rest of the competition? When deciding on the source of competitive advantage, how can you ensure that what you do is not eclipsed by your competitors?

This gets back to the point about understanding the competitive environment, and understanding what the market is capable of accepting. Information systems can help overcome these considerations through improved market analytics, process automation, improved information

decision-making, and improved process flexibility and responsiveness. However, the effectiveness of these and other IS interventions is dependent on a sound business strategy and effective business models. In terms of the specific sources of competitive advantage (Valacich & Schneider, 2012), IS can contribute in the following ways:

Source	Focus	IS Support/Enablement
Quality	High-quality of product/service delivered	Data analytics, fault diagnostics, automated supply chain processes.
Service	Customer loyalty through customer service	Improved customer insight through data analytics. Improved user experience and Design (UED/UXD), CRM systems.
Low cost leadership	Market leader in low-cost provision of products or services	Data analytics. Automated supply chain processes. Improved demand planning & forecasting techniques.
Proprietary	Using Intellectual Property as a key differentiator	Secure data warehousing. Cyber-security. Information access control. Automated manufacturing processes.
Innovation	Speed to market for new products and services	Collaborative tools (wikis, team rooms, etc.). Improved customer insight through data analytics, and product development collaboration. Simulation and prototyping software/systems.
Brand	Building reputation and awareness	Social media, reputation may be based on any of the other sources of competitive advantage, IS will support accordingly.
Value	Customer loyalty through value for money	Customer insight through data analytics. Automated supply chain processes. Improved demand planning & forecasting techniques.

Table 2.6: IS Enablement of Sources of Competitive Advantage

Table 2.6 demonstrates how information systems can be used to support the development of competitive advantage. However, it must be remembered that the true value and impact of technology can only be realised when it is properly aligned to the organization's strategic plan, and not delivered in isolation, or without understanding the overall impact on the business as a whole.

2.3.2 Porter's Five Forces and the Impact of Technology

A good way of visualising how information systems can influence and affect the competitive environment can be achieved using Porter's five forces model (Figure 2.3). This model was developed by Porter (1985) to show how levels of competition develop within an industry. It draws upon industrial organization (IO) economics to derive five forces that determine the competitive intensity and, therefore, the attractiveness of an industry. Attractiveness in this context refers to the industry's overall profitability. An "unattractive" industry is one in which the combination of these five forces acts to drive down overall profitability.

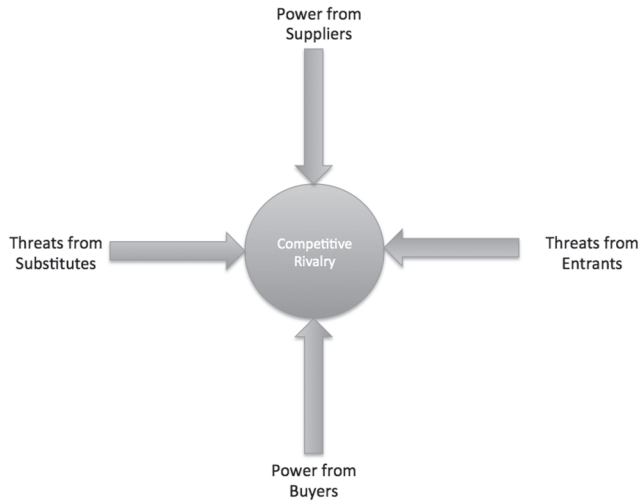

Figure 2.3: Porter's Five Forces Model (Porter, 1985)

The five forces as identified by Porter (1985) can be described as follows:

- **Threat from New Entrants**: Profitable markets that yield high returns will attract new competition. This describes the ability and ease by which new competitors can enter the market. Organizations already in the market will look to identify ways of blocking new entrants into the market.
- **Threat from New Substitutes**: Substitute products and services may seduce customers away from a company's products and services. These are products and services that are not necessarily seen to be in direct competition, but may provide an alternative service or product. For example, Coca-Cola and Pepsi are competitors, but drinking water might be seen as an acceptable substitute.
- **Power from Buyers** (customers): This is based on the ability of the customer base to put the company under pressure to change their product/service specifications, availability, and/or price structure. Buyer power will increase with increasing competition within the market.
- **Power of the Supplier**: Suppliers of raw materials, components, labour, and services will have an increased level of power over other organizations when competition is low and/or there are few substitutes.
- **Competitive Rivalry**: The intensity of competitive rivalry is, for most organizations, the main determinant of the competitiveness of an industry. Organizations will continually strive to find ways of building their competitive advantage, either through the development of unique resources and capabilities or the manipulation of the other four forces.

Information systems can be employed to help re-set the balance of power across all five forces. Table 2.7 highlights, through some examples, how organizations can, and are, using their information systems to successfully build/reduce barriers to entry, increase/reduce supplier and buyer power, increase/reduce the impact of substitutes and build competitive advantage.

Porter's Force	IS Influence
Threat from New Entrants	• IS can be used to better analyse market opportunities. • IS can be used to react faster to market opportunities. • IS can be used to allow faster penetration into global markets.
Threat from New Substitutes	• IS can be used to provide better market/threat analysis. • IS can be used to provide better customer insights concerning potential shifts to substitutes.
Power from Buyers	• IS can be used to provide an ability to reach more customers via internet enabled sales and marketing. • IS can be used to provide customers with access to greater choice in terms of products and services.
Power from Suppliers	• IS can provide instant access to a much wider range of suppliers. • IS can be used to build more integrated relationships between suppliers and businesses. • IS can track price/availability/transport times for suppliers thus better matching the suppliers' offering to the business' requirements.
Competitive Rivalry	• IS can be used to improve stock control, demand planning and forecasting. • IS can be used to speed up order management and logistics operations. • IS can be used to support new product development and launch processes. • IS can be used to stimulate innovation through a better understanding of customer requirements, improved communication, and internal/external collaboration.

Table 2.7: IS Influence on Porter's Five Forces

Interestingly, information systems can be viewed as a double-edged sword in that they can build barriers and remove barriers to market entry. Certainly, the pervasive nature of technology provides everyone with the same technological tools, but it is how these tools are used by the business that will determine how successful the organization is in protecting its competitive position within the industry. In effect, information systems have the ability to change the dynamic relationship between all five forces and these in turn shape the competitive nature of an industry.

2.3.3 Aligning IS to Compete: A Value Chain Perspective

The use of information systems has become one of the main ways of improving the efficiency of supply chains. The notion of the supply chain is not new, but its relative importance to an organization's continued success has become a key focus point for senior managers. Porter's (1985) model is still used to visualise the core business functions involved in making up a supply chain (Figure 2.4)

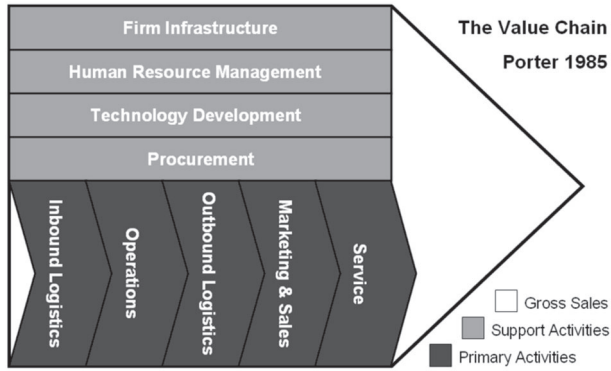

Figure 2.4: Porter's Value Chain (1985)

Irrespective of whether the organization provides physical or digital products and services, all organizations will have supply chains, and, therefore, a need to manage their supply chains. The size, length, and complexity of these chains will vary dependent on the industry, what's

being provided, the number of stages involved, and the number of partners required to get the product or service from its raw state to a finished, delivered product or service to the customer. In effect, supply chains will be unique to each organization. They will also be susceptible to change. As the business changes by reacting to market changes, so too must the supply chain. The link between the supply chain and the changing needs of the business is manifest in the way the business processes are designed and implemented.

Every time the organization needs to develop a new way of delivering its products or services it needs to define the business process stages involved in getting the products or services from manufacturing through to final delivery. These stages will cross inter-functional boundaries, and maybe even inter-organizational boundaries. As such, the organization must ensure that each stage is adding value to the overall product or service offering. Some of the ways of adding value may include the following:

- Taking cost out of the process (cost recovery).
- Taking time out of the process (speed).
- Testing the product/service (quality assurance).
- Fault diagnostics/management (reduced wastage).
- Securing access to Intellectual Property (IP) (securing IP).
- Expedient invoicing (revenue generation).

Some of the ways that process stages can take value from supply chains are as follows:

- Unnecessary repetition of stages (slowing down throughput).
- Focusing on irrelevant quality metrics (failure to stop wastage).
- Manually intensive repetitive processes (slow, error prone, and costly).
- Poor data management (poor forecasting/demand planning).
- No E2E process monitoring (poor supply chain optimisation).

When an organization can identify all the process stages as adding some form of value, then the supply chain may also be referred to as a **Value Chain**.

Once again, information systems can help reduce inefficiencies in the supply chain largely through providing a clear end-to-end view of the supply chain's real-time performance. The development of such a view will

allow the business to fine-tune the chain at its various stages. Seeing the chain from an end-to-end perspective allows the removal of dead-end process steps, repetition, and ineffective process stages.

Time Out

Think about it: Barriers to entry

Fortnum & Basin is a chain of high street retailers with outlets all over the world. They pride themselves with having a high standard of customer service and high-quality products. Because of this they charge a premium fee. However, as they do not manufacture their own products, and many of the products they sell (or similar products) are now available via the internet at a lower cost, they need to re-think how they engage with their customers and continue to differentiate their offerings.

Consumer shopping habits are changing, and more and more consumers are happier to purchase goods and services via the internet. This is causing a problem for Fortnum & Basin who have invested a lot of money to build a high street presence in many cities and towns around the world.

Iain Said (CEO) is aware that their existing customer base remains loyal to the Fortnum & Basin brand. However, they are missing an opportunity as there is a growing number of competitors operating via the internet selling similar products to a much wider market. This is causing some concern amongst the Fortnum & Basin Board of Management, as they see a failure to react to this new level of competition as a direct threat to Fortnum & Basin, and they want to know what Iain and the Senior Management Team are going to do about this.

Fortnum & Basin is heavily dependent on technology to support the logistics and distribution processes, as well as maintaining a customer loyalty system. However, they have made a conscious decision to keep their "technology" in the background when it comes to customer engagement – favouring a more personal "face-to-face" experience for the customer. The mantra on the shop floor in every outlet is "understand the customer's problem, and build a lasting relationship".

The pressure is mounting to respond in some way to the growing online competition, but Iain is smart enough to realise that this is not simply a case of building a sales-enabled website. Iain knows that to get into a low-cost battle with the competition will undermine their current cost-structure, and ultimately end badly for Fortnum & Basin. Technology has allowed competitors to enter the market at a relatively low cost; the question is, can technology also help Fortnum & Basin to reduce the impact of the internet competitors on their customers?

Questions:

- By developing a sales-enabled website to compete on cost with the new online competition, what impact will this have on Fortnum & Basin's current customer base?
- How can Fortnum & Basin use technology to take advantage of the growing online market without adversely impacting their existing customer loyalty?
- How can technology be used to 1) strengthen the current relationship between Fortnum & Basin and their customers, 2) weaken the impact of the competition on the growing online market?
- Is there a good business strategy, or a good IS strategy that will solve this problem? Will it be possible to succeed with only one, or does Fortnum & Basin need both?

2.4 Aligning IS with Corporate Strategy

As technology plays a more important part in managing an organization's information requirements, information systems start to assume a more central role in the overall strategic development. Therefore, organizations need to consider how the IS strategy aligns to, and supports their overall strategy. Considering the complexity inherent in most information systems, Kearns and Sabherwal (2007) suggest some guiding principles when aligning the IS and organizational strategy.

- Strategy (both IS and organizational) is driven by customer needs and expectations.

- Processes selected for re-design by IS must create value for the customer.
- The IS must support those processes in a way that supports the overall strategy.

There are two key points that need to be considered here.

1. The use of the term "customer" can relate to either internal or external customers. Not all technology enabled changes or implementations will result in an obvious improvement for the external customer, as many back-office processes will be the focus of such changes. However, what Kearns and Sabherwal (2007) would argue, is that consideration should be given to how the internal customers will interact with, and use these systems.

2. The second point is that there is no real benefit to the organization if the IS strategy is customer-focused, but the overall strategy is not.

Boddy *et al.* (2009) define three possible types of relationship that can exist between organizational strategy and information systems strategy.

Relationship Model	Relationship Type	Characteristics
1. Strategic Choice Model	Org Strategy determines IS Strategy	Organizational strategy dictates the IS strategy. The flow is "one-way" with the IS strategy reacting to the explicit requirements of the organizational strategy.
2. Technological Determinist Model	IS Strategy determines Org Strategy	Technology dictates the direction and scope of the organization's overall strategy. Business opportunities and objectives are limited to what can be achieved by the IS capability.
3. Interaction Model	Org Strategy and IS Strategy affect each other	IS and the overall strategy are developed in tandem. The focus of the IS is not technology enablement but improving competitive advantage through information enablement.

Table 2.8: Strategy Relationship Models

Of the three relationship models (Table 2.8), it is the third possible relationship that provides the most benefit to the organization. With the interaction model, the organization looks for ways to use its information systems to support its strategic objectives. However, the organization is also looking for ways to use its information systems to build competitive advantage. This requires a more collaborative approach to strategy development.

2.4.1 Alignment points between IS and the Business

As information systems become a more integral part of the business strategy it is important to consider how, and in what way, technology and business need to align. The points of contact between business and technology need to be understood, but also how the business and the IS strategies manage the alignment between what they are currently capable of, and what they hope to achieve as part of their respective strategic objectives. In essence, if the strategies are unrealistic in terms of their expectations, it doesn't matter how well-aligned the IS and business strategies are – the expected outcome will not be realised. Returning to Tapscott (2004), successful organizations must have realisable business models that the IS can be shaped around. Many organizations build IT systems to support poorly conceived or tested business models. In many cases, it was not the technology that failed to deliver, but the lack of a competitive business model. Sabherwal *et al.* (2001) have visualised the alignment points that need to be considered between IS and business.

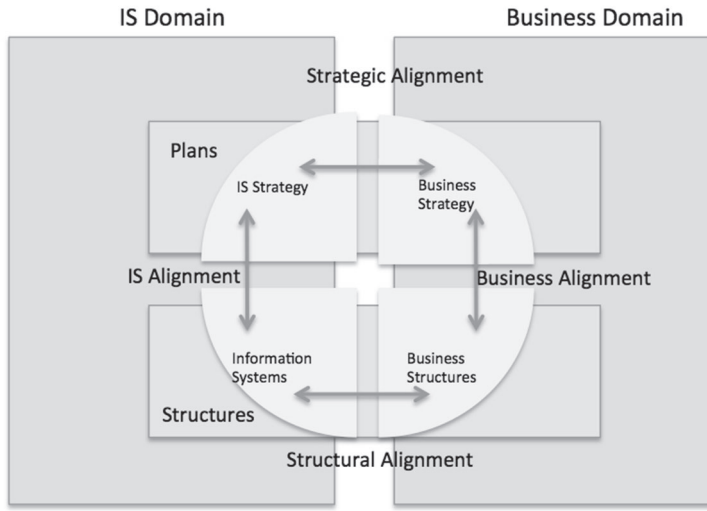

Figure 2.5: Alignment between IS and Business (from Sabherwal *et al.,* 2001)

This diagrammatic representation of alignment identifies four key areas that need to be managed if true and effective alignment between business and IS is to be realised. These key areas are:

- **Strategic alignment:** How well-aligned are the IS and business strategies? Have they been developed in a technologically deterministic way, or through an interaction model (Table 2.8)?

- **Business alignment:** Do the current business models support the strategic objectives of the current strategic plan? Is the current strategic plan realistic in terms of what it is expecting from the business?

- **IS alignment:** Does the IS strategy realistically reflect what the technology and the organization are capable of delivering? Does the current IS deployment deliver against the current IS strategic objectives?

- **Structural alignment:** Is the current information system capable of supporting existing business models? Does the business have to react

to what the technology limits it to, or does the technology react and respond to the changing needs of the business?

What is not apparent from Figure 2.5 is the dynamic nature of the alignment process. Because of the changing nature of business, and the ongoing technological advancements, organizations must continually review and refine what is happening at these four points of alignment.

2.4.2 Potential Benefits of Alignment between Strategies

As alignment between IS and business strategies starts to happen, how will the benefits of alignment start to manifest? Obviously, different organizations will have different strategic objectives. However, some of the more common benefits will be experienced as follows:

- **Competitive advantage and business growth:** This can be through any of the sources of competitive advantage discussed in Table 2.6, and/or through business growth with new business models leading to new market penetration.

- **Productivity gains:** Improved supply/demand management and forecasting techniques due to improved data analytics and management. Also, providing valuable customer insights through data and business analytics.

- **Business transformation:** Using IS to improve and streamline business models. Allowing the automation of process areas without compromising business model flexibility or responsiveness. Also improving the speed of transformation without adversely impacting business operations.

- **Responsive IS:** Building a more responsive IS to better respond to changing business and customer needs. More responsive systems are more attuned to supporting the customer experience, and capturing key data to be used to develop new products and services.

- **Efficient IS:** Identify where cost can be taken out of the core supply chain processes without compromising flexibility or responsiveness.

- **Realised Innovation:** Improvement is seen in the way innovative ideas and business models are defined, evaluated, tested and implemented, or released to market.

What is common to these benefits is the fact that the impact is mainly being realised at a business level. If the benefits of an IS strategy or implementation are not being appraised in terms of their business benefits then they need to be. Therefore, what every CIO should be asking is:

How can our IS, and IS strategy, add value to the business?

If they cannot answer this question, or the answer is not clear, then they should seriously reconsider whether their planned strategic and operational interventions are needed.

2.4.3 Asking the Right Strategy Questions

In considering the impact that an IS strategy will have on organizational performance, it is important to know who is best placed to define and develop such a strategy. If we accept that an IS strategy must take into consideration how core business processes are constructed and operate, the knowledge required is not simply technical. The development of an IS strategy is a multi-stakeholder endeavour. However, there needs to be someone directing the planning activities to ensure they are focused on the core objective, which is alignment with the overall business, or organizational strategy. Therefore, the process of developing an IS strategy becomes a coordinated effort between the different parts of the business.

Ross & Weill (2002) identified six key decisions that should not be left wholly to the IT function. Although the article talks about IT, it is focused on the implications on the business side of an organization abdicating key decisions to the IT function. This may be simply down to the decisions having a strong “technical” focus. Ross & Weill (2002) go on to identify the potential consequences should the decisions be made without considering the impact to the business.

	IT Decision	Senior Management's role	Consequences of abdicating the decision
Strategy	How much should we spend on IT?	Define the strategic role that IT will play in the company and then determine the level of funding needed to achieve that objective.	The company fails to develop an IT platform that furthers its strategy, despite high IT spending.
	What business processes should receive our IT budget?	Make clear decisions about which IT initiatives will and will not be funded.	The lack of focus overwhelms the IT unit, which tries to deliver many projects that may have little value or cannot be implemented well simultaneously.
	Which IT capabilities need to be company-wide?	Decide which IT capabilities should be provided centrally and which should be developed by individual businesses.	Excessive technical and process standardisation limits the flexibility of business units or frequent exceptions to the standards increase costs and limit business synergies.
Execution	How good do our IT services really need to be?	Decide which features – for example, enhanced reliability or response time – are needed on the basis of their cost and benefits.	The company may not pay for service options that, given its priorities, are not worth the costs.
	What security and privacy risks will we accept?	Lead the decision-making on the trade-offs between security and privacy on the one hand and convenience on the other.	Overemphasis on security and privacy may inconvenience customers, employees, and suppliers; under-emphasis may make data venerable.
	Who do we blame if an IT initiative fails?	Assign a business executive to be accountable for every IT project; monitor business metrics.	The business value of systems is never realised.

Table 2.5: Abdicating Key Decisions to IT (Ross & Weill, 2002)

Ross & Weill (2002) break down the key decisions between those impacting "strategy", and those impacting the "execution of strategy". What is clear

from the table is the need for active business involvement at all stages of the IS strategy building process.

Certainly, IT Management and the Chief Information Officer (CIO) will play a significant part in the development of the IS strategy. However, the level of business involvement will depend on the level of trust and maturity that exists between the two parts of the business. Some organizations may have a very basic technical support function that is primarily used to ensure IT service availability and reliability for systems such as the internet, email, web host, backup and recovery. These organizations may struggle to engage the IT function in business decisions, and this is a relationship that needs to be developed with all key stakeholders being able to understand, and step up to their new responsibilities.

2.4.4 Responsibility for IS Strategy Development and Implementation

So far, this chapter has focused on the importance of developing an IS strategy that is aligned to the business strategy. In developing such an IS strategy it is crucial to do so in a collaborative manner, where the strategy is not developed in isolation, but with the input and support of other key business decision-makers across the organization. So, how can an organization develop an effective IS strategy when so many different stakeholders want to have their say, and in some cases drive their own agendas?

The most common approach is to put one person in overall change who is then responsible for the alignment and operation of the information system. This person usually assumes the title of IT manager, IS manager, IT director, or chief information officer (CIO). This role has traditionally gone to someone with a technical background. However, in recent years the importance of technology and information systems has grown from that of simply providing IT services, to business enablement. To this end, many companies are now giving this role to individuals who have a strong business awareness, as well as technical knowledge.

Although the IS/IT manager or CIO will develop the IS strategy, other members of the organization will be needed to provide input, review, and approve the strategic plan before it is implemented. For the IS strategy to truly support the business strategy, senior or executive management level

involvement must be assured. This will help raise the importance and need for IS and business strategy alignment, and encourage engagement from the other parts of the organization in the strategy development process. Chaffey & White (2011) have identified four approaches to assuring the business is properly engaged.

1. **Appoint an IS/IT director/CIO to the board:** This places the role that IS plays, and can play in business development right in front of the senior/executive management team. IS/Business enablement opportunities can be identified and discussed. Opportunities will not be so readily identified without an IS champion on the board, and IS may continue to be seen as no more than a cost to the organization.

2. **Ensure a board member is ultimately responsible for IS:** Membership to the board is not based on technical competence but on being able to contribute in a business leadership capacity. If there is no opportunity to elevate the IT manager/director/CIO to the board then some other member must be selected to champion the role and benefits of IS to the rest of the board. Traditionally, this role has been given to the chief financial officer (CFO). The head of operations, marketing, or even the CEO may also assume this role.

3. **Initiate a steering committee or a special working group:** A steering group may be set up to define the IS strategy and control IS expenditure and projects. The steering group can be used to evaluate project and expenditure progress, as this level of detail may be too much for the board, and would only serve to overload and slow down decision-making. The steering group should be made up of representatives from across the organization, and a representative from the board, who in turn can provide steering guidance, and report back on the group's progress.

4. **Identify a business unit leader:** In some organizations the management of information systems is distributed across different business units. Responsibility for corporate-wide application and systems delivery may be maintained centrally, with distributed responsibility for a business unit's specific information and technology requirements handled by the business unit IT/IS manager. Once again, the business unit IT/IS manager should work

closely with the respective business unit leader to ensure alignment between the IS strategy and the business unit strategy. The CIO/IT director responsible for corporate IS strategy will need to ensure they have a good line of communication between them and their business unit IT/IS managers.

Any combination of these four approaches is designed to raise the importance of information systems in making the business more competitive, and to bring the IS and business domains closer together.

Time Out

Think about it: IS/Business Alignment

Alsum Books Ltd. is a high street bookstore with over 50 outlets operating in over 10 countries worldwide. The business has grown organically over the last 25 years with the focus on providing a friendly place for book enthusiasts to meet and socialise. The model has worked well with many bookstores hosting book-reading events, book clubs, and independent author book launches.

Many of the bookstores are laid out and stocked to fit within their respective social and business communities. Because of this, Alsum Books Ltd. reaps the benefits of being a global brand, but with a local feel.

Alsum Books depends heavily on its information systems to keep track of stock levels and customer reading preferences. This helps to keep on the shelves the books that are relevant to the customer base, and helps to identify the potential of new books and authors who will be of interest to the customer base.

Up until now, Alsum Books has never really had any problems with its IT. Yes, the odd server goes down, or email crashes, but overall, the level of service is good. When systems need to be updated, removed, or replaced, then Alex Wyck (IS Manager) costs the project, gets it approved and then implements the change. Alex is very good at implementing the necessary changes without really impacting the business – because of this, Alex is generally left to get on with the job of managing Alsum's IT.

However, Andre Bartle (head of sales) is seeing an increase in the number of requests for digital books, as well as an increase in the number of authors looking to publish their books independently online. This, Andre believes, is a significant opportunity for Alsum Books. What they need is some form of online publishing portal for authors, and a content management system for digital content that will allow customers to purchase digital books. Andre builds his case for the publishing portal and the content management system and presents his idea at the next senior management meeting. Naomi Hendrickson (CEO), and the other senior managers think this is a great idea and they should look at implementing the necessary systems as soon as possible. Alex (who is not a member of the senior management team) also thinks this is a good idea – however, he informs the senior managers that he is in the process of implementing a more cost efficient stock management system (which they had all been told about), and would not be able to implement the portal and content management system for at least 6 months.

Naomi and the other managers remember being briefed but didn't realise the implications of the current IS upgrade on the business' ability to change. Fortunately, this time delay is not a big issue, but Naomi can't help thinking "what if we absolutely needed to make a change to our business model, and found out we couldn't do it straight away because of our IS/IT?" It could have a significant impact on their competitive position. This is not Alex's fault, it's down to how they work, but how can they ensure they don't get held back like this in future?

Questions:

- How did this misalignment happen?
- Why is this a problem now?
- How do you think the senior management team view the IS/IT?
- What sort of criteria should IS/IT projects be evaluated against?
- How can the company better ensure that the implementation of the IS strategy continues to support the business?

2.5 Learning Summary

This chapter has focused on the issues associated with the effective alignment of a business strategy and an IS strategy. The distinction is made between Information Management (IM), Information Systems Management (ISM), and Knowledge Management (KM): three vital components of any technology dependent strategy. It is important that organizations planning a more effective alignment between their business and IS strategies need to ensure that all three components are considered when developing an overarching information systems strategy. Usually, one of these components will dominate the strategic thinking so it is important that the right focus is defined. This will be largely determined by the nature of the business, and the industrial sector in which the organization currently operates.

What IM, ISM, and KM have in common is the importance all three put on the role that "information" plays in helping an organization to achieve its strategic goals and objectives. The focus is not on the technology itself, but on the value that technology (computer systems in this case) brings to the organization as a whole. This can prove a challenge for many organizations where the focus of those responsible for delivering information systems subtly shifts from the "information" to the "technical" aspect of the systems. The focus on the technical aspects of any system underlines the notion of an IT strategy, which, unlike IM, ISM, and KM is more concerned with the integration, deployment, and maintenance of technology resources across the organization. The core difference between an IT strategy and an IS strategy is that the main focus of the IS strategy is about business alignment, and enablement for competitive advantage.

All organizations will be different, irrespective of whether they are in the same industry. As such, how they approach the process of strategic planning will also differ. This different perspective will be influenced by factors such as skills, culture, path dependency, perceived value of the contribution, existing technology capability and the strategic aims of the organization. The existence of these factors will shape the manner in which technology is viewed by the different parts of the business, and subsequently, how technology is expected to support the overall business strategy. However, an effective IS strategy should exhibit the following four basic characteristics:

- Maintain alignment between IS and business strategy.

- Keep it simple.
- Continuous review.
- Built in flexibility and responsiveness.

As the development of any strategy should be a continuous process, many intended strategies need to be re-evaluated or even terminated based on the changing nature of the operating environment. This introduces the concept of an emergent strategy that effectively fine-tunes an organization's initial strategy to a point where it develops a realised strategy. This realised strategy is the result of an organization that constantly reviews, revises and modifies its strategy to take into consideration the nature of the changing competitive environment. Therefore, if the IS and business strategies are to be aligned, then the IS strategy must understand the business environment. There are many ways that an organization can develop a competitive advantage, and we must accept that technology can contribute significantly in building and maintaining these advantages. However, when deciding on which aspects the organization wants to develop into a competitive advantage there are a few considerations worth thinking about first:

- Is the source of the competitive advantage actually what the market wants?
- Can the source of the competitive advantage be developed in a sustainable way?
- How unique can you make the source of the competitive advantage?

Once again, this goes back to the need to understand the competitive environment.

Because of the complex nature of the relationship between the business and IS operating environments there are four key alignment points that need to be managed as part of any overarching alignment initiative:

- **Strategic alignment** between the business strategy and IS strategy.
- **Business alignment** between the business strategy and business structure.
- **Structural alignment** between the business structure and information systems.
- **IS alignment** between the IS strategy and information systems.

If these are not collectively managed there will be no meaningful alignment between the IS and business strategies. As alignment between the IS and business strategies starts to happen the benefits will start to manifest. These benefits will include competitive advantage and business growth, productivity gains, business transformation, a more responsive IS, a more efficient IS, and realised innovation. What is common to these benefits is the fact that the impact is mainly being realised at a business level. Therefore, if the benefits of an IS strategy or implementation are not being appraised in terms of their business benefits, then they need to be.

A common mistake when developing an IS strategy is to leave it solely to members of the IT function. The development of an effective IS strategy must have input from the business side of the organization. Therefore, although the IT/IS manager or chief information officer will develop the IS strategy, other members of the organization will be needed to provide input, review, and approve the strategic plan before it is implemented.

2.6 Case Study: Implementing an eCRM system in a FTSE 100 Company

This case takes a critical look at an e-business initiative (eCRM) undertaken by a FTSE 100 listed global technology organization in 2004. This organization was recognised as a world leader in developing and implementing complex information systems for both public and private sector organizations worldwide. The initiative was designed to link together the sales, marketing, fulfilment, manufacturing, and distribution systems in order to reduce supply chain stock levels, increase responsiveness to customer demands, and increase profit margins by providing a direct link to customers (circumventing business partners for some product lines).

Unfortunately, after significant financial investment (approximately $300M USD), and 3 years of development the project was deemed a failure, and subsequently cancelled. The eCRM project was downgraded and re-focused on simply delivering a web-interface for online sales and product enquiries. The programme failed to deliver against its original objectives; however, certain lessons can be learned that will help prevent the high cost of failure on future projects.

The overall aims of the eCRM system were certainly ambitious, and very much in line with driving a flexible customer focused business strategy. The main intent of the eCRM project was to reduce the amount of stock in the supply chain pipelines going out to business partners and customers, and improve profitability by providing a direct route to end customers for some high-value products. However, the manner in which the eCRM model would drive improvement was to focus on six key areas of performance. Not only would profit levels increase and stock cost levels decrease, but also eCRM would drive significant transformation across all aspects of the business. The six key transformation areas are as follows:

- Customer relationship;
- Production planning;
- Basis of competition;
- Business model;
- Value chain; and
- Manufacturing capability.

It is believed that success in these key areas is vital if the business is to successfully integrate its information systems with its changing business models. The organization's strategy is to become more customer focused, and therefore, it needs to change the way it engages with its customers, but also modify its existing channel strategy to provide a direct line between the organization and its end-customers. However, it is important to remember that this project needed to be managed and deployed in the correct sequence. It is no use developing the manufacturing capability if its basis for competition has not changed to allow the marketing and selling of customised products and offerings.

The main project development was driven out of the organization's US HQ with this team having responsibility for the overall scope of the project and the back-office, or the eCRM "engine", whilst the geographies had responsibility to ensure that the system, once deployed took into consideration the local and cultural aspects of the way the organization interacted with customers and business partners.

The organization stopped the eCRM project after 3 years and significant investment. At this time there were still no elements of the system online or even near completion. In effect, the project was still on the drawing board with no clear date for testing or deployment. The reason for stopping the project was based on a number of factors; the failure to deliver any working components after 3 years of development, the failure to provide realistic delivery dates, and the failure to prevent significant project drift due to constantly changing requirements; all aspects of change that need to be managed in order to stand any chance of embedding a successful complex information system.

Why did the eCRM project fail to be implemented? Certainly, the aims of the project were ambitious, but this was a globally recognised provider of technology solutions; a company whose business was selling complex technology-based business solutions.

A starting point in trying to understand the reasons for the potential failure of the eCRM project would be to consider the alignment between the IS and business domains. Although the eCRM delivery mechanism was heavily dependent on technology there were cultural, strategic, and stakeholder (employee and customer) capability issues that would also need to be considered. As the eCRM system is an organization-wide initiative its success would be dependent on its acceptance, not just by one group of users, but also by the organization as a whole. When the project was analysed the following key points were identified as contributing to the overall failure:

- A vision was defined and communicated, but at too high a level. It was difficult to see how employees could contribute to the success of the eCRM.
- The senior management team had established a sense of urgency, but there were no regular companywide communications to reinforce that urgency, or to provide progress updates.
- The development of the eCRM system was mainly being controlled by the company's IT specialists. There was little direct involvement in the development from the other business functions.

- There was a feeling that the main obstacles were not being removed. This is because the strategic business units which were responsible for their own process changes were too removed from the development of the eCRM system to react and remove the main obstacles. This was compounded by poor communication throughout.

There was a consequent failure to successfully implement the eCRM. The implementation of this or any other complex technology solution needs buy-in at all levels of the organization, and must support the understood business objectives of the organization – otherwise, as seen with the eCRM, confusion over objectives, deliverables, involvement, and resources will negatively impact the project's chances of success.

Questions

1. How do you think the alignment between the IS and the business domain was handled? Using the Sabherwal *et al.* (2001) alignment model, consider how that failure manifested at each alignment point.

2. A lot of key decisions were left to the IT function through the course of the development. Select three decisions you think were left to the IT function, and state what you think were the consequences of those decisions to the project, and finally how these decisions should have been handled.

3. Chaffey & White (2011) identify four characteristics (2.2.2) that should be present in any successful IS implementation. How do you think this project displayed those characteristics, and, considering these characteristics, what could have been done to ensure a more successful outcome?

4. Considering the complex nature of the change that was the eCRM, is it practical for organizations to consider such large, time-consuming initiatives, and how can they better determine their chances for success?

2.7 Review Questions

True/False Questions

2.1 If you have the latest technology you will be successful. T or F?

2.2 An IS strategy should be left to the IT function to define. T or F?

2.3 There are four key alignment points between the IS and business domains. T or F?

2.4 Information Management and Information Systems Management are the same thing. T or F?

2.5 Knowledge can be defined in terms of tacit and explicit knowledge. T or F?

2.6 Approximately only one-third of information is acquired from documents. T or F?

2.7 Aligning investment in IS with business goals is a key objective of the IS strategy. T or F?

2.8 The speed at which we can access technology will give us a sustainable competitive edge. T or F?

2.9 Technology should be viewed in terms of what business value it will bring to the business. T or F?

2.10 An IS strategy should consider the need to develop an understanding of the connected information needs of the organization. T or F?

2.11 Information systems are mainly concerned with the storage and retrieval of data. T or F?

2.12 Effective deployment of an information system must consider organizational culture. T or F?

2.13 A strong strategic business focus applied to the development of an IS strategy will result in improved IT Services. T or F?

2.14 Information systems do not contribute to improving the organization's innovation capability. T or F?

2.15 Only technology-based organizations can truly benefit from technology. T or F?

2.16 Information systems should be developed in tandem with business models. T or F?

2.17 There are five key stages in developing an IS strategy. T or F?

2.18 The development of an IS strategy is a specialised technical process. T or F?

2.19 A key characteristic of a good IS strategy is to "keep it simple". T or F?

2.20 Business is changing too quickly to develop a strategic vision. T or F?

2.21 An emergent strategy is better than a planned strategy. T or F?

2.22 Changing external environmental forces have no impact on strategy development. T or F?

2.23 The duration of an IS strategy should be based on technology deployment timeframes only. T or F?

2.24 As technology is a commodity, strategies to deployment are fairly standard across industries. T or F?

2.25 The IS focus should be mainly on the improvement of internal processes. T or F?

2.26 The IS can have a significant impact on improving the end-customer experience. T or F?

2.27 Information systems can directly improve an organization's competitive advantage. T or F?

2.28 The latest technology can overcome the need for a good business model. T or F?

2.29 Technology can be used to help manage all five competitive forces as identified by Porter (1985). T or F?

2.30 In terms of developing an effective IS strategy an interactive model is the best form of relationship. T or F?

Multiple Choice Questions

2.31 Which of the following is not a valid alignment point between the IS and business domains?

A. Strategic alignment
B. Business alignment
C. Information system alignment
D. Cultural alignment

2.32 Which of the following decisions should IT management not make alone?

A. Which business processes should receive our IT budget?
B. What resources should be given to IT service management?
C. What security and privacy risks will we accept?
D. Which IT capabilities need to be company-wide?

2.33 Which of the following will help to improve business awareness of the business value benefits of technology?

A. Appoint an IS/IT director or CIO to the board
B. Ensure a board member is identified to be responsible for IS
C. Regularly present/roadshow new technology to employees
D. Set up a steering committee/special working group

2.34 Which of the following is not a key stage in developing an IS strategy?

A. Conduct a situational analysis
B. Define a vision and objectives
C. Review, control and correct
D. Form a technical group to define a strategy

2.35 When focusing the IS strategy on business value which of the following is not normally a key influencing factor for consideration?

A. Skills profiles
B. Organizational culture
C. Existing technology capability
D. Existing access to software applications

2.36 According to Earl (1996), an IS strategy should look to achieve which of the following?

A. Alignment between business and IS goals
B. Exploitation of IT for competitive advantage
C. Developing technology usage policies
D. Improving morale amongst IT staff

2.37 Which of the following is not necessarily a source of competitive advantage?

A. Quality
B. Improved data processing
C. Low-cost leadership
D. Brand

2.38 An effective strategy should exhibit four basic characteristics. Which of the following is not one of the four characteristics according to Chaffey & White (2011)?

A. Management reporting
B. Maintaining alignment
C. Continuous review
D. Keep it simple

2.39 Information systems can be used to enhance the customer experience. Which of the following does not really do this?

A. Improve product quality
B. Improved adoption rate for new technologies
C. Improve employee satisfaction
D. Improved products and services

2.40 Which of the following is not one of Porter's five forces?

A. Competitive rivalry
B. Threats from potential entrants
C. Power of potential buyers/customers
D. Technology availability

2.41 Which of the following are ways that information systems can add business value to the supply chain?

A. Taking cost out of the process
B. Taking time out of the process
C. Testing/quality checking
D. Providing computerised user interfaces

2.42 Which of the following is a model for engagement between business and IS in terms of strategy development?

A. Tactical Choice Model
B. Technological Constructivist Model
C. Interaction Model
D. Innovation Model

2.8 Review Question Answers

True/False Answers

2.1 F, 2.2 F, 2.3 T, 2.4 F, 2.5 T, 2.6 T, 2.7 T, 2.8 F, 2.9 T, 2.10 T, 2.11 F
2.12 T, 2.13 F, 2.14 F, 2.15 F, 2.16 T, 2.17 T, 2.18 F, 2.19 T, 2.20 F, 2.21 F
2.22 F, 2.23 F, 2.24 F, 2.25 F, 2.26 T, 2.27 T, 2.28 F, 2.29 T, 2.30 T

Multiple Choice Answers

2.31 D, 2.32 B, 2.33 C, 2.34 D, 2.35 D, 2.36 A, B, C, 2.37 B, 2.38 A,
2.39 B, 2.40 D, 2.41 A, B, C, 2.42 C

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Chapter 3: From IT to Digital: Assessing the Organizational Impact

Learning Objectives

On successful completion of this chapter you will be able to:

- Define what "digital" means in terms of technology adoption.
- Explain the driving forces (internal and external) that are causing organizations to re-think how they utilise technology.
- Describe how a digital approach will impact the existing organizational work processes.
- Distinguish between "digital" and "IT" as two distinct approaches to support organizational performance.
- Define the characteristics of a "digital" approach to embedding technology within the organization.
- Explain why a digital approach is important in building responsive supply chains.
- Describe how a digital perspective can support core organizational success factors.

3.1 Introduction

This chapter will look at what it means to be a "digital" organization; what this means in terms of the existing IT function within an organization, and the changing relationship the IT function now has with the rest of the organization. There is certainly a lot of hype concerning the notion of what "digital" means, and a lot of organizations are trying to find their way in terms of moving from the current view of technology to something as yet undefined.

There is a lot of confusion over the notion of "digital" that is not being helped by organizations viewing it as a uniquely technology-centric activity. For many, "digital" is just a term to group together the latest set of internet enabled and enabling technologies. Although "digital" is dependent on, and certainly enabled by such technologies, this is a significant over-simplification of the "digital" concept. As will become clear through the

course of this chapter, "digital" represents a shifting paradigm as to how organizations now need to view and engage with technology. The actual technology itself is not so important, as it will continue to change and evolve over time. What is important, however, is how organizations, workers, customers, and any other stakeholders re-think how they use technology to build competitive, innovative products and services in a way that develops competitive advantage.

3.1.1 What Do We Mean by "Digital"?

The term "digital" seems to be creeping into every aspect of senior management conversation. The topic is not limited to just those in the IT profession, or IT departments, but is being driven and shaped by questions from all across the organization's functional units (marketing, sales, finance, operations, R+D, IT, HR, etc.).

The cause of this increasing level of demand for better technology utilisation is largely down to a number of relatively recent advances in technology as highlighted in Table 3.1 below:

Technology Advancement	Impact
Improved broadband speed (fibre optics)	Improved ability to access and download and upload media-rich content.
Increase in Wi-Fi availability	Provide continuous access to internet services and content.
Reduced cost for storage devices	Provide scalable, affordable, continually accessible virtual data storage.
Introduction of affordable mobile smart device technology	Accessible and compatible tools for continued internet access. Driving up demand for online content.

Table 3.1: Impact of Advances in Technology

These technological advances have, in turn, allowed for the development of software applications and follow-on technologies that are helping organizations automate and optimise critical business processes. Whilst

applications and follow-on technologies are continually being enhanced and improved, they can broadly be grouped into five core areas. These areas define what "digital" means from a technology perspective – but do not provide any real clarity from a business, or organizational perspective.

The five main digital enabling technology areas can be classified as follows:

Digital Area	Description
Big Data	Increasing volume and access to internally and externally generated structured and unstructured data sets.
Cloud	Virtual, adaptable, secure internet-based storage, and application hosting.
Mobile	Mobile devices that are connected to the internet.
Social	Internet based social media sites.
Media	Media formats for HDD video, music, etc.,

Table 3.2: Key Areas for Digital Technologies

What makes the "digital" discussion interesting is not the technology underpinning it, but the questions and concerns it is raising within organizations (both in the public and private sector). Listed below are some points that help to describe the nature of what it means to be digital.

- This is no longer a topic of conversation solely relating to IT.
- Everyone has a view of what "digital" means.
- No one is really sure who should take the lead in implementing a digital programme.
- Technology is fundamental to "digital", but it is not the only thing under consideration.
- The focus is moving from managing data to accessing information.
- The technologies at the heart of the digital discussion have yet to be fully understood in terms of their impact on organizational performance.

One must realise that everyone, including academics, consultants, software and hardware providers, IT professionals, and marketers, will have an opinion that will be shaped by their own view of their organization's technology and performance needs. What is causing this differing perspective is the way in which the digital discussion transcends all aspects of the organization.

Fundamentally, "digital" is about improving access to information that will enable timelier, and cost-effective decision-making, that in turn will build a more responsive, customer-focused organization. In short, the goals of any "digital" agenda or strategy should encompass at least the following:

- Providing information for better business decision-making (**improved decision-making**).
- Developing a responsive customer-focused organization (**improved customer engagement/retention and acquisition**).
- Developing flexible and responsive business models (**improved organizational responsiveness**).
- Developing demand-sensitive products and services in a cost-effective manner (**improving the cost of producing digital products and services**).

Therefore, "digital" is more about "intent" in terms of what is required to improve the organizational responsiveness and performance. It is not so much about the technology used to achieve the goals outlined above. Technology will continue to change and improve, and organizations will continue to try and understand how best to adopt and integrate it into their businesses. "Digital" is not important because of the technology that currently underpins it, but because of the way it is causing organizations to re-think how they view technology, and the role it plays in supporting their businesses. An example of this is shown in Figure 3.1, illustrating the cost curve profiles for traditionally manufactured "physical" products (CDs, DVD, books, newspapers, etc.) and digital products, examples of which include, online news content, online movies, downloadable music and software, ebooks, etc.

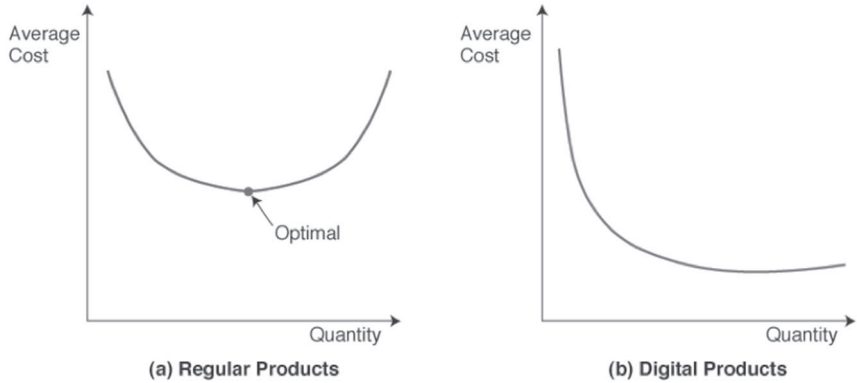

Figure 3.1: Cost Curves for Regular and Digital Products

For regular products (a) an optimal point is reached where the average cost is optimised for production quantities. As demand increases past this optimal point the average cost per product increases. This cost can be related to an increase in labour, manufacturing, and/or distribution costs. However, the nature of the cost curve is different for digital products (b) the cost will increase due to the possible need for additional servers, and mirror sites to meet increased online demand. However, the overall increase in cost associated with producing more digital products and services would not be expected to increase in the same way as the cost for regular products (a).

3.1.2 Factors Influencing the "Digital" Discussion

With the low cost and availability of, and access to, internet-based services, many software providers have developed their applications to run on any operating system. Users can access the applications they want to use simply through the web browser on any of their mobile devices. Individuals and business functions are now able to access data using tools that they can directly access or download via the internet. This has introduced new challenges concerning the security of internal data and maintaining the integrity of the existing management information systems embedded within the organization. However, these issues will be addressed later in Chapter 11: Securing your information in a world of open access.

It is important to note that data and information are becoming more accessible via inexpensive applications that can be hosted on almost any type of internet enabled mobile device (smart phone, tablet, laptop, smart watch, etc.). The balance of power in terms of how employees and customers access data is shifting from the organization to the end user. As such, end users are also now moving between personal and work-related use across all their devices, and, therefore, how end users interact with their own personal devices is blurring the lines between work and personal use. Organizations need to ensure they can connect to their increasingly tech-savvy customers through a growing number of technology dependent channels (phones, watches, laptops, smart TVs, tablets, AdSense, smart texting, etc.). This in turn is reshaping the conversation as to what "digital" is, from a purely IT-based "cost v. benefit" discussion to a multi-stakeholder conversation focused on how the organization is aligned to its market and how to improve overall performance. This conversation is raising questions from all aspects of the organization such as: How can we use technology to…

- Improve the way we connect with our customers?
- Improve the way our employees connect into our information systems?
- Enable our employees to work in the way that best suits them?
- Better understand what our customers actually want from us?
- Turn concepts into actual products and services that we know our customers will want?
- Better understand what opportunities and threats exist in our highly dynamic markets?
- Improve the way we openly collaborate between internal groups, and with our customers?
- Deliver our products and services in an innovative way to our customers?
- Improve our supply chain performance?
- Improve overall organizational performance and competitive advantage?
- Develop a unified approach to improving performance, and to decide who will be responsible for owning our "digital" implementation?

Within each of these questions, technology plays the role of enablement. The questions listed are not exhaustive, but they all point to the need to

improve performance through the better use of technology. Different functions within an organization have a need for internally and externally generated data that in turn are required to support mission-critical decision-making. Some examples of how these would manifest across an organization are highlighted below in Table 3.3

Function	Data requirement to support…	Key Decision
Executive Level	Market profiles, ROI, qualitative and quantitative performance analytics…	Setting strategy direction, objectives, and investments/divestments decisions.
Operations	Demand planning, logistics, distribution scheduling…	Improve the matching of supply with demand. Improve logistic/distribution routing to optimise costs. Maintaining high standards of quality.
Sales	Competitive analysis, price point/profit recovery planning, sales targeting…	Adjusting sales initiatives to changing market forces.
Marketing	Predictive analysis, trend analysis, crowd sourcing…	Sensing changing customer behaviours, market opportunities.
Finance	Invoicing, reconciliation, financial analytics…	Optimise product sets for maximum revenue return, minimise bad debts, improve cash flow.
Manufacturing	Design, development, quality analysis, stock control…	Reduce the product development life cycle, improve quality, and improve customer input.

Table 3.3: Data Requirements for Key Decisions

The increased demand for data across an organization is being driven by a need to flex and respond to changing market forces within an increasingly dynamic market place. This, in turn, is being driven by the adoption of technologies such as cloud-based services, high-speed internet, and the

increasing number of devices accessing the internet at a global level. This is having a significant impact on the competitive profile of organizations operating in different markets. Access to new markets in different geographical regions can be set up and controlled from anywhere in the world. This is a double-edged sword as this instant access into other regions and markets also means competitors can now also easily access your market. As organizations are no longer geographically bound to their market places they now have to face global competition for their products and services. In order to remain competitive, organizations must get better at how they read the competitive world around them. This means better access to data.

The demand for access to data and, therefore, the development of a digital strategy to coordinate and effectively manage this demand is being driven by a number of issues. These can be broken down into internal and external factors. The factors outlined below are not extensive, but highlight those most commonly influencing organizations.

Internal Factors: These are factors that manifest within the organization that are largely due to how the organization is structured in terms of existing technology, processes, and culture, and what it needs to do to remain competitive.

- **Need for improved responsiveness**: Internal awareness needs to be more responsive to customer requirements.
- **Need for customer engagement**: Retaining customers is less costly than acquiring new ones. Therefore, better understanding our customer requirements will help retain them.
- **Need to reduce costs through automation**: Many activities within an organization can be automated and, therefore, improve the cost efficiency of core business processes.
- **Reducing the cost of technology**: Storage and processor technology costs have greatly reduced over the last few years. This has resulted in the development of cloud-hosted services that can deliver all the functionality of locally hosted systems at a fraction of the cost.
- **Need to reduce the product development life cycle**: Getting new products to market quickly, without compromising on quality, is an imperative for competitive capability.
- **Existing technology deployment**: What technology does the organization currently use? How mission-critical is it, and how

easily could it be migrated to digital technologies (such as cloud, mobile, social media)?

- **Capturing and developing innovative ideas**: Ensuring the customers and employees are connected in a way that encourages collaborative teamwork and open innovation is core to developing competitive products and services.

External Factors: These are factors that manifest outside the organization but will influence how the organization and its competitors need to react in order to continue to compete within the market.

- **Supply outstripping demand**: Services and products can be acquired from anywhere, at any time, without the end user or customer leaving their seat.
- **Ubiquitous access to technology**: Technology is readily accessible and cheap. Anyone can set up a business online with few start-up costs, and start to sell services and products worldwide.
- **Access to data**: Data are becoming more accessible. Google Analytics can provide basic analytics to organizations without any significant cost. Many social media sites are also beginning to collect and analyse user data that can be acquired for a relatively low cost.
- **Customer interaction**: Customers are increasingly defining the way in which they now want to interact with the organization, and how they wish to consume products and services.
- **Growth of global competition**: Competitors are no longer geographically constrained. If an organization can generate an increasing demand and level of profitability for its services or products, competition will grow from global competitors.
- **Growth of social media**: Social media have allowed a space for consumers to voice their satisfaction and dissatisfaction with purchased services and products. These sites also provide an opportunity for organizations to reach out to consumers in the communities they feel comfortable in.

3.1.3 Digital: A Changing Perspective?

New digital technologies are changing the way that organizations view and interact with data. Organizations that view themselves as **Knowledge Intensive Services** (KIS) are at the forefront of the push to better understand and utilise emergent technologies to improve performance.

However, a key consideration for organizations is how to identify, collect and analyse the data generated from multiple internal and external sources, and make more effective decisions. The focus is no longer on the actual technology, but on what the technology will allow an organization to do with the data generated. This means that the concept of "digital" will mean slightly different things to different individuals and organizations. Because of the increasingly competitive nature of business, organizations need to be quicker at sensing and responding to changing market forces. An inability to respond can leave an organization behind the competition, and if they fall too far behind this may have a significant impact on their ability to compete in the future. There are many examples of organizations that have failed to respond to changing market demands, or market opportunities. Listed below are some examples of well-known organizations that have fought and failed to maintain market dominance.

- **De Havilland v. Boeing** (1949) – Aircraft: De Havilland is slow to resolve design flaws in the Comet airliner, allowing Boeing to introduce the 707, which captures the growing market.

- **IBM v. Microsoft** (1981) – Operating systems: IBM loses out to a new start-up company called Microsoft over the development of the DOS computer operating system.

- **Inktomi & Google** (1997) – Web search algorithms: Inktomi fails to realise the commercial opportunities for their search engine algorithms. Google, however, does not.

- **Nokia & Apple** (2005) – Smart phones: Nokia fails to capitalise on smart phone technologies, and the consumer's desire for more interactive phones.

- **Boeing v. Airbus** (2007) – Aircraft: In a failure to judge the consumer needs for long haul flights, and the operating models for

international airlines, the Airbus 380 wins the majority share for future airliner demand.

- **Microsoft v. Google** (2009) – Web technologies: Microsoft fails to see the potential for more internet-based applications. Google develops a suite of applications that eclipses Microsoft's internet-ready applications.

These examples identify organizations that held dominant market positions (IBM, Inktomi, Nokia, Boeing and Microsoft), but then lost the position to a more responsive, market-aware organization. Prime mover status is no guarantee of holding on to a dominant position in a dynamic market place. Although IT systems were not the catalyst or cause of the market shifts in these cases, technology is certainly becoming a factor for organizations that are identifying and responding to new and emerging market opportunities.

The issue is not a new one, and organizations will continue to win and lose in the struggle to gain market share. However, the rate of change and volatility within markets have increased significantly over the last few years, and continue to be driven by technology. For organizations to keep up with market demands and opportunities they need to be aware of market behaviour, and their own ability to respond to opportunities and threats within the current, or any future market place.

On identifying the opportunities and threats, organizations need to continually modify and refine their business models. These models define how the organization develops products and services to satisfy its selected market segment. The business models also define how the organization will maximise value to both the consumer and the organization through the engagement process. Most organizations will have multiple models to manage, and in turn these models will be dependent on technology. This will especially be the case if the models are designed to scale production and to support operations at a global level.

Recent rapid advances in ICTs, specifically in internet and mobile technologies, have highlighted the rising importance of the Business Model (BM) in Information Systems (IS). Despite agreement on its importance to an organization's success, the concept is still fuzzy and vague, and there is no consensus regarding its definition. (Al-Debei & Avison, 2008)

The statement provided by Al-Debei & Avison (2008) highlights the issue with providing a suitable, all-encompassing definition of "digital". However, the problem facing organizations is real in terms of their ability to sense and respond, and utilise technology is both the problem, and the solution. The challenge now is for organizations to think differently about technology.

Organizations are tackling the "digital" challenge in different ways. The figure below shows how different industrial sectors across Europe are adopting digital technologies, and integrating them into their operating models.

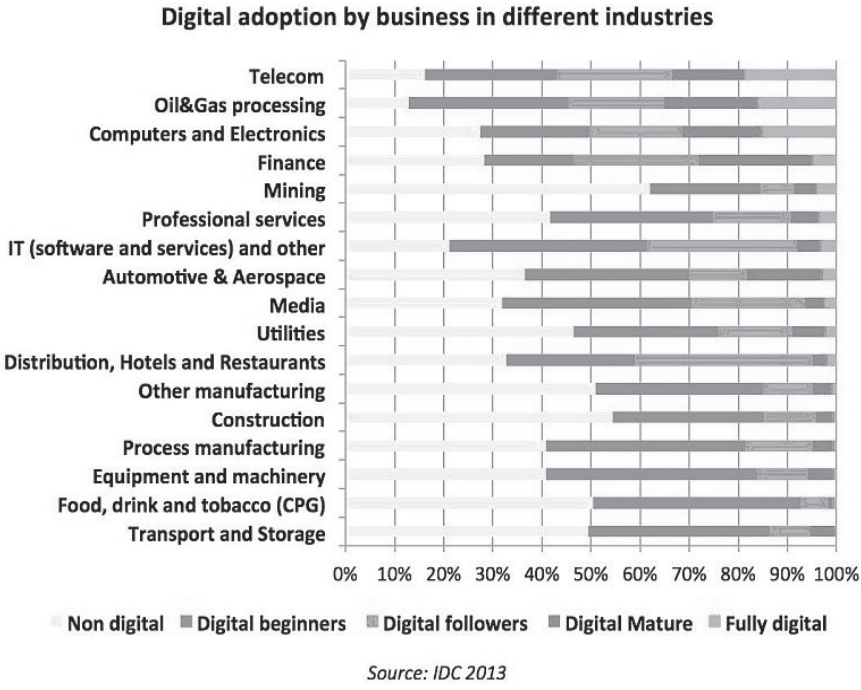

Figure 3.2: Digital Adoption by Industrial Sector

As shown in Figure 3.1, the degree of digital integration varies across the different industrial sectors (Eleftheriadou, 2014), and will be driven by the internal and external factors already mentioned in section 3.1.2. It should also be noted that it is not a race to fully adopt and integrate digital

technologies into an organization. What is important to remember is that the organization needs to define what is appropriate for it in order to achieve its core objectives. This will depend on the devised strategy for the organization, and how it is aligned to the current and future technological landscape. The alignment of technology and strategy is covered in more detail in Chapters 2 and 4.

Time Out

Think about it: Characteristics of a Digital Implementation

You've just started to work for a company that builds high-precision pumps for the medical and nuclear industries. The product has not really changed much in terms of design over the last 10 years. However, competition is now growing from companies in Malaysia, Canada, and within Europe. The existing IT systems have been updated to allow internet access for email and secure access to the network for off-site employees. There are also IT systems to support manufacturing, finance and HR – however, these generally run as independent systems. Apart from this, not much has changed in terms of the technology being used to support the organization. The CIO (Pieter van Viel) is a competent IT professional who has been with the company for 15 years and manages the current IT infrastructure from within the IT function. All requests for changes, updates, and new technologies need to go through, and be approved by Pieter's part of the organization.

At a board meeting Fran Smith (CEO) raises some concerns about the growing competition from overseas organizations. Fran, and the rest of the management team know that they cannot afford to get into a price war with the competition, as they cannot match the low cost of manufacturing. Everyone is also aware that they are selling pumps into a niche market, and that they are already at near capacity. Fran says that if they don't do something, they will not be able to maintain their competitive position in the market…

Helen Atkins (Marketing Manager) mentions going "digital", but isn't really sure what this means apart from using social media. Pieter (CIO) adds to

the conversation that he's not really sure how this would help, as they have all the technology that they need…

Fran is unsure how to proceed; she knows there's something in the concept of "digital" but is not sure how best to develop this for the organization.

Questions:

- How would you describe the concept of "digital" to the senior management team?
- What would be your advice to the senior management team concerning the best way to approach a discussion on "digital"?
- Taking the internal and external factors as a guide, how would you consider a digital approach that could improve the company's ability to respond to these factors?

3.2 Breaking with a "Traditional" View of IT

IT has traditionally been seen as a cost to organizations. The value that IT delivered was generally in reducing costs through process automation and improved quality of service delivery. Because of the large-scale commoditisation of, and accessibility to technology most organizations failed to consider how technology could be used to build and sustain a competitive advantage for the organization. As a result, the IT function started to become a siloed, reactive part of the organization – reacting to the needs of each part of the organization's particular IT requirements, whilst failing to consider the overall end-to-end impact that technology was having on the organizations' ability to perform.

However, technology is once again being seen as a facilitator and enabler for innovation across an organization. This may be simply through connecting individuals with shared interests around the organization, facilitating customers and design teams in reducing product development life cycles, or allowing marketing professionals to collate, aggregate, and analyse disparate data sets from internal and external sources. One thing is certain, and that is, for organizations to be competitive, they need to be

better at managing their collective resources; of which technology is a significant resource.

To that end, organizations need to re-think how they view their IT resources; no longer thinking of them as purely a cost to the system, but as a potential profit multiplier, revenue generator, and/or a way of opening new channels to market. IT is still at the heart of the business, but it is no longer enough to have technology – it's how you use it to make your organization more responsive to your customer requirements that is important.

3.2.1 Transforming the IT Function

Tinkering and short-term fixes are no longer enough to keep up with the changing demands being placed on the IT function. Those organizations seeking a stronger performance based on digital technologies need to change the way they approach the design and delivery of IT services. More connected customers and automated processes and the need for sophisticated business analytics are placing increasing demands on the IT function. This increased pressure on integration, access, and analysis cannot be solely supported in any long-term manner, through small, incremental fixes. There needs to be a re-thinking of how IT is provisioned and utilised across the organization.

The IT function can no longer be seen as a cost to the organization, but potentially a new source of competitive and strategic advantage. This, however, is not an easy task, and as such any transformation will not only have technology implications, but also cultural, political, and operational implications across the entire organization. At the heart of any digital transformation is the requirement to increase access to information that has been created internally and externally to the organization. This shifting requirement for access to information will influence who makes the important decisions within the organization. As "information is power", this may have a significant impact on the political landscape across the organization. Chapter 8 (Information Systems: Shaping the Organization) will cover this topic in more detail.

According to the Centre for Information Systems Research (CISR), technology convergence, innovation and improved customer experience are among the factors driving the digitisation of enterprise organizations (Weill & Woerner, 2013). However, as we can see from Figure 3.1, levels of digital

adoption remain quite diverse across organizations and industrial sectors. At lower levels, organizations have been successful in digitising simpler core processes such as on-boarding new employees, reconciling quarterly/yearly financial reports, or order taking. However, the more complex operations such as innovation, strategy creation and alignment, or the implementation of organizational change remain far less digitised.

This diversity is also apparent in how spending is being managed amongst digital projects. According to the CISR (Weill & Woerner, 2013), in a survey of over 2000 chief information officers working with US-based organizations, only 39% of enterprise-wide investment in digitisation is in the IT budget. The remaining 61% of spending is spread throughout the enterprise, and tends to create six or seven diverse islands of digitisation. These tend to be:

- Production & Operations;
- Engineering;
- Research & Development;
- Knowledge Work;
- Digital Products; and
- Customer Interaction (including social media, mobility, and websites).

The challenge for organizations is how these diverse digital projects, and the IT projects, can be coordinated from an overall organizational perspective.

3.2.2 Challenging the Traditional View of the IT Function

Traditional companies don't need to be told that competitors that are "born digital," such as Amazon and eBay, have a digital advantage by virtue of their lack of legacy operations. Among digital natives, IT is both a support and a leadership function. Compared with many industry incumbents, IT plays a greater role in strategic decision-making and innovation, influences a greater share of investment, and recruits better talent. Indeed, we often think of these competitors as technology companies, when they're really retailers that just happen to be digital. One example is given of the way in which Amazon thinks differently to the traditional retailers against which it competes: it invests five times more in IT as a share of revenue and is a top destination for technology graduates. Amazon's

technology and data capabilities have been central to its ability to scale up from a book retailer to an open marketplace with leading customer-experience ratings (Andersson & Tudderham, 2014).

The drive to digitisation is changing the demands on IT in three principle ways (Andersson & Tudderham, 2014).

1. **Increasingly Sophisticated Technology**: Netflix, the global online film distributor, has developed a recommendation system that will analyse terabytes of information to successfully recommend 70% of customer choices. Even coffee chains are introducing mobile payment and loyalty apps.
2. **Greater IT-delivery performance**: While efficiency was previously the most important performance measure for any organization, now everything matters. Time to market is critical as businesses compete on how digital innovations get to consumers.
3. **Increasing Business Engagement**: IT must prepare for much greater business engagement and oversight from senior management. This is being driven by the increased value that is at stake should an IT project fail. Due to the complexity and impact a potential IT project will have across an organization, delay or failure can have a significant impact on the organization's ability to operate, and remain viable.

Traditionally, performance for IT-related projects was primarily focused on the efficiency of the IT-based solution. Scaling production or the increase of any throughput was seen as a key delivery from IT. As with the demand for greater IT-delivery performance, digital solutions are expected to deliver high levels of performance across at least five key areas.

	Performance Measure	Description
1	Efficiency	Products and services need to be able to flex in terms of customer demand patterns. This requires efficient scalable processes to handle changes in demand throughput.
2	Quality	There is a heightened consumer expectation of quality for all products and services. Therefore, quality must be high to prevent the migration of customers to competitive offerings.

3	Reliability	There are no manual work-rounds in the digital environment when technology fails. Therefore, systems have to be very reliable.
4	Security	Securing the vulnerable online environment from cyber-attacks is vital. Loss of customer data could cause irreparable damage to an organization's reputation.
5	Time	Businesses compete on the time to market; increased returns to scale encourage a winner-takes-all market grab.

Table 3.4: IT Performance Measures

These measures are not new, and in fact many organizations will strive to deliver against them all. However, now organizations need to be delivering against all five measures in order to deliver performing digital solutions.

3.2.3 Re-focusing the IT Function on Digital

Reinventing the IT function to deliver digital-enabled systems can provide a new competitive advantage for organizations. As previously stated, different systems will be appropriate for each organization. Therefore, there is no "one size fits all" template to follow. However, Andersson & Tuddenham (2014) have identified elements that are critical to achieving the IT performance improvements they believe are required to help organizations adapt to the new digital world. These elements, in themselves, are not new, but the focus they bring to an organization helps to develop an end-to-end business perspective for assessing, implementing, and managing technology for competitive positioning.

1. **Boardroom Leadership**: Ownership and commitment at a senior level are vital to the success of any key initiatives. As projects focus on the development of any digital capabilities that will have a wide organizational impact, it is important that all of the key stakeholders know that the organization is committed to delivering against them.
2. **Effective Communication**: Getting the message right for the right stakeholder groups. Different members of the organization, as well as customers, vendors, investors, and strategic partners will need to have

the initiatives explained to them in ways that address their concerns, and these will differ amongst the stakeholder groups. Without support from the stakeholders it will be difficult to implement any change, irrespective of how beneficial it will be.

3. **Up-skilling**: New skills will be required in order to get the new technologies, workflows, and work practices embedded within the organization. The organization needs to be aware of what these skills are, and have a plan in place to acquire them; whether through external sourcing or internal development.
4. **Sourcing for Scale**: Vendors will need to be able to scale up to meet an unpredictable demand. This usually requires changes to vendor contracts to provide options for additional development capacity without lengthy bidding processes, and agreements with select niche vendors that can provide more specialised skills.
5. **Agile Development**: Delivering high-quality end products quickly requires new ways of working, including agile development, rapid release cycles, automated testing and deployment, and a "test and learn" approach to changes. Surprisingly, organizations often find that the greatest challenge here is not within IT but in persuading the business to adopt this approach.
6. **Open Innovation**: Develop a more inclusive and open working relationship between IT and other business functions, and the end customers (external and internal to the organization). This will help to identify innovative ways to engage with products and services that are driving demand for the organization's offerings.
7. **Adopting Cloud-based Technologies**: Rapid time to market and scaling to meet increased consumer demand require lean infrastructure operations and an elastic, cloud-based infrastructure.
8. **Focus on Data Analytics**: Sophisticated technologies such as customer relationship management systems require high-quality data that are unpolluted, maintained by the business, and integrated into a single data set. One solution is to launch a joint business-IT programme that identifies priority data, measures data quality, and agrees on remedial actions to reduce data pollution.

Any programme or initiative to re-invent the IT function will need to continue to deliver benefits to the organization. According to Andersson & Tuddenham (2014), the most successful transformations develop a two-speed approach. A new high-speed and agile IT function is created to run alongside the existing legacy-driven IT function. The new high-speed group is then tasked to focus on one or two high-value business areas requiring a

digital capability. This allows the high-speed group to develop and deliver successful digital interventions within the short to medium term without being restricted by existing IT legacy issues. This approach has been successfully used within a number of UK-based financial institutions, to develop online retail banking services. In one instance, a bank opened a new development office with a start-up culture and a value proposition designed to attract top IT talent. As new developers joined with the requisite skills, the company moved to agile working and rapid IT system releases. New stable service architecture masked the underlying complexity, allowing IT to rapidly innovate a new customer-facing functionality on top of the technology platforms. Finally, the high-speed function created a new scalable infrastructure stack that allowed it to rapidly deliver IT-supported business solutions and scale up to meet new demand. Just 18 months later, the bank began rolling out these lessons across the remainder of its IT function.

Time Out

Think about it: Where to start on the digital journey?

You are the CEO for a chain of 25 bookshops – mainly located on or near university campuses. The company was founded in 1975 and has had a successful business model built on the provision of school and college books, as well as the normal range of fiction and popular books. The company also has a growing business in the provision of books from new and niche authors. This combination of location, niche offerings, and segment dominance has ensured ongoing success for the last 10 years.

Technology is very much seen as a secondary "need to have" resource for managing stock levels, financial systems, and HR systems. The company has a website with limited commerce facilities, preferring to direct most of its transactions via the bookshops. Ted Novell, who has learnt all he knows through hands-on experience over the last 15 years working for you, manages your technology. Ted manages a small team of four people who are responsible for ensuring the systems don't crash, fixing any end-user service issues, managing user-system access, fixing printers, and backing up critical systems and databases.

Over the last 2 years the bookshop managers have been reporting an increase in demand for online purchasing, and the ability to download content in eBook format. A main factor influencing this demand is the changing business models of the universities, many of which are now developing and delivering online and distance learning courses. This is resulting in many of the universities' customers (students), who in turn are the bookshops' customers, taking up distance learning options.

You, as CEO, need to understand how best to support these customers who are increasingly looking at technology as the main form of access to your store. You are also aware that a failure to respond to this shifting method of engagement will present an opportunity to your competitors. You also realise that this isn't just about updating your company websites, you have also been surprised by the company's failure to gauge how quickly the demand for online sales would grow, and how little you seem to know about what your customers want, and how they want to consume it.

Questions:

- What do you think is the most important task – gaining insight into what your customers want in terms of products and services, or discovering how to build an online interface to allow the sale of the existing products and services...and why?
- In terms of changing the organization's focus from IT as a cost-centre to building competitive advantage, what elements do you need to consider addressing in order to create the right environment for "digital" enablement?

3.3 Developing a "Digital" Enabled Organization

As discussed already, the notion of what "digital" means will depend on the organization. Each organization will have a different perspective on what it needs in terms of the market characteristics. However, fundamental to any digital adoption journey will be the need to connect the different parts of the organization to improve information sharing and market and customer awareness. This increased flow of

information between business functions, customers, and vendors will have an impact on how information is shared. According to Davenport (1995), information is power, and power is not easily shared. “Digital” is not just about the technology; it is also about the way individuals interact with each other across the organizational boundaries.

3.3.1 Supporting a Move into a Digital Market

It is important to understand the differences that exist between “traditional” markets that mainly focus on the provision of physical goods and services and the emerging online global markets. With the advent of the online global markets we see:

- **Transactions are both physical and virtual**: More consumers are looking to conduct their business on the internet. Organizations need to be able to service this increasing requirement, whilst continuing to service their customers through the traditional physical channels.
- **The markets are unstable**: With traditional businesses it was easier to control access to markets. Their control of consumers shaped how they interacted with organizations (high street shops, mail order, etc.) and even local legislation concerning access, content, and tax. However, online markets have changed all that. Competitors don’t need to develop a “high street” presence, or develop a costly traditional advertising campaign, or even be in the same economic/trade zone to make their products and services available.
- **The markets are fast moving**: With access to markets becoming harder to control, organizations need to be quicker at identifying and reacting to new opportunities and threats. The development of new products and services to meet changing consumer patterns is vital for continued success.
- **Firms are becoming more interconnected**: In order to sense and respond to the changing demands of the markets, organizations need to be better at developing core strategic capabilities. The requirement for resources is continually changing and organizations need to manage this in a way that continues to build capability and optimise the use of available resources. This has necessitated organizations identifying strategic and tactical partners in order to continue to deliver value to their customers. This increasing network of partnered organizations is dependent on the fast, effective, reliable, and accurate transfer of information and data.

- **There is high uncertainty in the markets**: Supply and competition are increasing across most markets. There are very few organizations that have total control of their environment. Because of this, challenges can come from competitors within or external to the market. An example of this was the dominant position that Nokia held in the mobile phone industry. Nokia had prime mover status in the mobile market, and had no intention of relinquishing the position. At the same time, Apple had developed a way of providing access to a vast library of downloadable content (iTunes), and music and mobile phones were traditionally two very different and separate industries. However, by merging the two through technology, Apple was able to seriously undermine Nokia's dominant market position.

It is important to note that the traditional and digital markets are not mutually exclusive. Organizations can find themselves operating in a traditional market that is migrating to an online market. Commercial banking is a prime example of this, where customers can now access and conduct online, most if not all, services normally provided by the high street branch. Other examples of traditional markets that are developing an online presence are books and music, grocery shopping and academic course delivery. Organizations are being forced through customer demand to enter the online environment. This is bringing them into the global online arena, where, for some products and services, they now face direct competition from companies based all over the world.

With the dynamic and volatile nature of the competitive environment, organizations have to get better at sensing what's going on, and developing suitable responses to any new challenges they may face. This means that how information gets shared and acted upon is now a core ability to be developed. For many years, IT has focused on the "technology" and not the "information". This is now changing, with organizations realising the critical importance that information plays in developing and sustainable competitive advantage.

Therefore, what "digital" means to organizations will vary depending on the industrial sector they are in. For example, farming will have different "digital" needs to tourism, manufacturing, pharmaceuticals, or telecommunications. However, that said, at a fundamental level the notion of "digital" is about using technology to ensure an organizations relevance in a dynamic and competitive environment. In order to do this, it is no longer

enough to simply have IT. Now it's about how the technology is aligned to flexible and responsive business models.

For organizations to embrace a "digital" mind-set they need their technology to help develop capabilities in the following areas:

Capability	Description
Flexible Business Model Development	Organizations need to be able to build and deploy responsive business models to meet changing market and customer requirements.
Improved Decision-making	Having the information or data within an organization is important, but not of any use if it is not getting to the right individuals at the right time. Therefore, organizations need to re-think how they source, and make accessible information, and delegate decision-making responsibilities to key individuals.
Improved Cost of Quality and Scale	Use technology to automate processes and maintain the quality of delivered products and services when scaling for increasing demand.
Improved Customer Engagement Experience	Improve the customer experience in order to build loyalty even through digital delivery channels (online).
Dynamic Vendor Coordination	As markets change, organizations need to be able to ensure their vendors can also change in step with their requirements. This requires a better, faster, and more open approach to information sharing amongst partners.
Improved Market Analysis	Organizations need to be better at collating and analysing both internally and externally generated data. An inability to understand what is happening within the competitive environment, or even what's happening within the organization will seriously compromise an organization's ability to remain competitive.

Table 3.5: Digital Enabled Capabilities

As can be seen, these are not technical capabilities, but organizational capabilities that are driving the need for a "digital" perspective across the organization.

3.3.2 The Impact of Digital on our Work Processes

Without doubt, technology is providing the tools and techniques to build more responsive, intelligent business processes. Through continuous feedback these processes can continually fine-tune and respond to changing market demands. Through the proper intervention of technology organizations can reduce the amount of manual intervention that is necessary to keep processes aligned to their needs.

The ability to reach out to customers and potential customers through social media (crowdsourcing) is changing the way some organizations are developing new products. An example is Audi's virtual lab. The Audi team used social media to crowdsource its ideas concerning the development of its in-car infotainment system. Customers were able to design their ideal in-car multimedia system based on how much money they were willing to spend. Car manufacturers are not the only organizations that see value in the rapid iteration of ideas and prototypes. Pharmaceutical companies are turning to "combinatorial chemistry" – which is an iterative process of drug discovery. Retail banking, public-sector service agencies, and educational institutions are also all experimenting with rapid iteration processes in an effort to better align themselves with customer needs, to drive cost out of their development processes and gather valuable customer and market intelligence (Thomas *et al.,* 2013).

Once again, the ability to sense and respond to changing market forces is driving the need to develop intelligent business processes. Intelligent processes are just another step on an evolutional scale for process improvement. The diagram in Figure 3.3 below (Thomas *et al.,* 2013) highlights how processes have developed over time, and in response to changing market conditions.

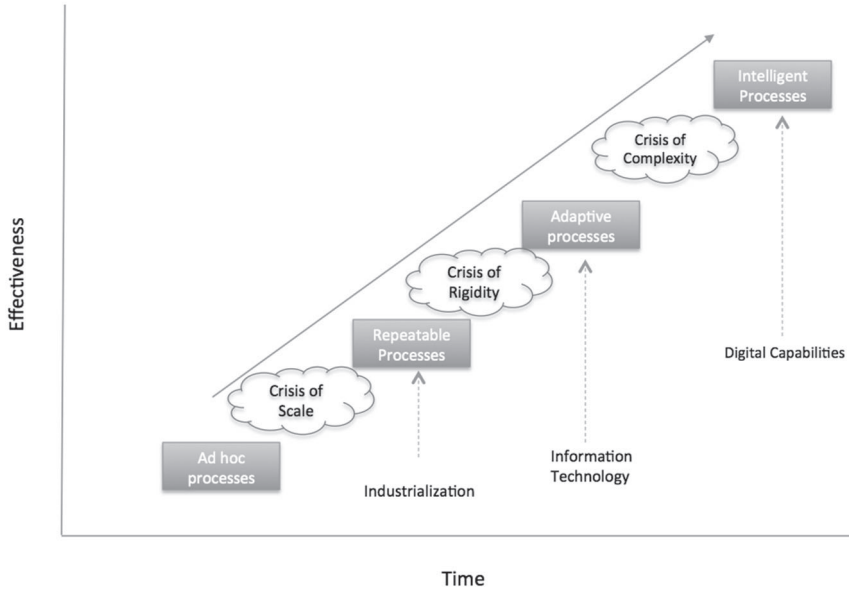

Figure 3.3: Evolution of Intelligent Processes (Thomas *et al.,* 2013).

Initially, organizations developed ad hoc processes to help them compete, but as their business improved many organizations struggled to scale up their production to meet demand. To overcome this "***crisis of scale***", organizations needed to develop processes that were more capable of increased throughput while maintaining the expected level of quality. An enabling function that helped organizations with this was the industrialization of manufacturing and business processes.

With industrialization came increased competition as organizations improved their ability to scale. This brought with it the ability to develop repeatable processes. However, with this era of repeatable processes came a new crisis – the "***crisis of rigidity***". Organizations needed to build flexibility into some of their core processes. Competition was increasing as more efficient processes started to drive down many costs associated with product development, thus allowing easier entry into markets. Organizations needed to develop more adaptive processes, to enable them to respond to changing customer demands and opportunities. A key enabler in building adaptive processes was access to information technology.

Organizations could now build automated processes that could provide multiple routing options for customer requests without the need for manual intervention.

Few organizations are responsible for all of the delivery aspects of their supply chains. Organizations rely on strategic partners and vendors to help deliver their products and services to their customers. This has introduced a level of complexity that must be managed if the network of strategic partners and vendors is to meet customers' demand for products and services. To overcome this "***crisis of complexity***", organizations need to understand how their processes interact and enable each part of the organization, and those other organizations in their supply chain. IT-enabled processes are no longer enough. Processes must now be more "intelligent", using data from other processes to analyse situations and provide suitable alternative options. These intelligent processes are no longer restricted to providing one of a set of pre-programmed responses or options, but are now able to develop new options, in real time, based on the data available for analysis.

Examples of intelligent processes are appearing in many different industries at the moment. We've already mentioned the sorting process that Netflix now uses to help choose movie recommendations for customers. Amazon also uses similar algorithms for its recommendation processes. Other industries including the financial sector monitor share prices and use intelligent algorithms to trigger "buy" and "sell" processes based on the data analysis of share and market profiles. The software industry is also looking at intelligent processes for software testing. Traditionally, software testing was a manual process requiring human intervention to test applications for interface and software issues. Through the development of intelligent processes, software development companies are now looking to fully automate this process.

As one would expect, this ability to replace many manual, and manually supported processes, with fully automated intelligent processes will have an impact on jobs across the organization. Be aware, that such changes to the way processes operate can be met with both positive and negative responses from the workforce. This will need to be managed if the process implementations are to be successfully embedded across the organization. Chapter 8 (Information Systems: Shaping the Organization) will cover the issues involved in introducing this type of change to an organization, and how best to manage the change.

Time Out

Think about it: Understanding the Challenge

You have assumed the role of Chief Financial Officer (CFO) for a medium-sized travel agency firm. The firm employs approximately 300 employees located in Toronto, Paris, and Sydney. The firm has seen steady growth over the last 15 years despite the recent global economic turmoil. A large part of the success has been the move into online bookings, and the development of a corporate travel service. The services provided have not changed much in the last five years, and the focus over the last few years has been the acquisition of new clients, as opposed to the retention of existing clients. Your company has lost clients over the last couple of years and this number is steadily increasing. However, new clients have offset the loss, so the overall impact has not been felt too much. As CFO, you've asked the Head of Sales and Fulfilment (Felix Luther) to find out from the dissatisfied clients what the main reasons for leaving have been. After a couple of weeks Felix informs you that "the main reason for leaving was not because of price but due to inflexibility of our services".

This is worrying as the number of clients leaving through dissatisfaction is steadily increasing. Coupled to this is the increasing number of travel agency firms looking to offer corporate services to your firm's existing client list.

You see this as a significant threat to your firm's market position, but realise that this is not a problem that solely rests with Felix and his Sales and Fulfilment team to fix. To that end you intend to raise this concern at the weekly senior management meeting. However, you also know that you will need to provide some guidance in terms of how to start addressing this problem…

Questions:

- At the back of your mind, you remember the notions of crisis of scale, rigidity, and complexity. Which one of these are you now facing?
- The clients gave a clear indication that your firm's inability to meet their changing travel needs is a major point of dissatisfaction to them. Which capabilities do you need to

develop in order to ensure that you can sense and respond to your clients' changing needs?

- Of the capabilities you see as being important in addressing the current "crisis", how do you see technology being used in their development?

3.4 Developing a Holistic view of Technology for your Organization

The IT function holds a unique position within the organization. In general terms it is the only function that is directly responsible for implementing and managing core information systems across all other functions. Although the processes being used to support the respective business functions are not necessarily operated by the IT Function, because of their role in developing IS solutions to support each part of the organization they have a unique end-to-end view of how the critical business processes are connected across the organization.

3.4.1 Why is a Holistic View Important?

Because of the need to better align technology to an organization's business models, a better understanding of how information and data flow throughout the organization is imperative. No longer can business functions such as marketing, R&D, finance, IT, manufacturing, etc., afford to operate in isolation. It is not good enough for one function within an organization to excel at making better-informed decisions, whilst other functions struggle to keep up. Organizations will survive and fail based on their overall performance, and their ability to align all parts of the organization to address any challenges together. It is no good if the marketing function can quickly assess shifting consumer trends, but sales and manufacturing cannot respond with a suitable offering. One of the key reasons for developing a digital capability is to better align information flows across the different functions so as to enable better decision-making and the alignment of products and services to changing customer needs.

3.4.2 Moving the Focus from Technology to Information

The greatest contribution that information makes to an organization is its ability to describe the competitive environment. As technology is central to effectively managing the information flows, senior management now expects a heightened awareness of the manner in which IT systems are designed, deployed, managed, and utilised in a way that can help to build better information pathways throughout the organization.

Before we progress any further, it's worth quickly defining what we mean by "data" and "information". There are many definitions to choose from. Chaffey & White (2011) define data and information as follows:

> ***Data:*** *Discrete, objective facts about events. Data are transformed into information by adding value through context, categorization, calculations, corrections and condensation.*
>
> ***Information:*** *Organized data, which is meaningful and contextually relevant. Used for decision-making.*

That said, English (1999) defines the relationship between the two as follows:

> *Information is data in context. Information is usable data. Information is the meaning of data, so facts become understandable.*

It is important to realise the role that context plays in turning data into information. It is also worth introducing the concept of knowledge. This concept is central to the ability to make more informed decisions in a timely manner. There are many definitions for knowledge, but for the purpose of this chapter we will look to Davenport & Prusak (1998):

> ***Knowledge:*** *is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information.*

The need to identify data and information that can build competitive capabilities is changing the focus on IT. Most technologies now deployed in organizations are relatively generic and commonplace. Most modern organizations will have access to computers running standard software

packages such as Windows/OSX, MS Office, Project, SAP, etc., with internet access available via multiple mobile devices, etc. This means the technology itself is not going to give you a competitive advantage – what might, however, is the way you use it. This is the challenge facing many organizations – to look at technology as a means of developing a unique positioning strategy. The focus, therefore, is no longer mainly on the technology itself, but on the information that can be used to generate the unique knowledge that needs to flow across the organization. This introduces one of the main challenges for information management today – information overload.

Information Overload

Some believe that there is no such thing as "information overload" (Davenport, 1994) because if information is really useful our appetite for it is insatiable. On one level this sentiment is true. However, the problem of information overload is very much a practical one. Four key issues compound this challenge, especially when we consider that many organizations now need to work with extremely large data sets. These issues are as follows:

- **Increasing Volume of Data (Volume):** The data being produced at the moment are growing at an exponential rate. In 2013 there was, at a global level, an estimated 4.4 Zettabytes[1] of digital data, which are expected to grow to 44 Zettabytes of data by 2020. This is effectively a 50-fold increase in data since 2010. As concepts such as the "Internet of Things" start to see more devices connecting to the internet, there will be a surge in the volume of data being generated. These data will need to be managed and analysed to ensure they provide value.

- **Understanding the Relevance of the Data (Variety):** How do you know what data you need? With the increasing volume of data comes the challenge of finding the relevant data in a timely fashion. A lot of data will now be generated external to the organization, mostly in ways that might not be obvious.

- **Trusting the Data (Validity):** With increasing volume comes the increasing challenge to be able to validate the data – can they be trusted? Who generated the data? Where did the data come from, and can they be validated by any other data sources?

[1] A Zettabyte (ZB) = $10x^{20}$ Bytes = 1000 Exabytes = 1 Billion Terabytes

- **Managing the Increased Flow of Data (Velocity):** Access to data is increasing. The challenge is to develop systems to analyse data before they become out of date. In some instances, this can mean being able to analyse data within milliseconds of receiving them.

These challenges are accentuated when organizations start to create and work with increasingly larger data sets. In effect, these challenges are characteristic of the problems associated with the concept of big data.

In particular, the notion of "variety" is compounded by the fact that data do not always present in the desired format. There are no absolute standards for digitally generated data, and as such data may exist in easily manipulated formats, or as a collective of obscure text strings, with no discernible structure. Generally speaking, there are two types of data that organizations need to work with.

- **Structured Data:** Data that conform to a defined format and structure, examples of which could be financial data, temperature, height, age, etc.; basically, data that are easily understood, and that present in a manner that is expected even if the source of the data is external to the organization.

- **Unstructured Data:** Data that do not conform to any pre-defined data format. This type of data is usually in a text format. The data may contain the same information as that contained in structured data, but the layout is irregular and difficult to analyse against more traditional database data structures. Examples of this might be extracts from an interview, video footage, excerpts from a book or magazine article.

Unstructured data present a significant challenge for organizations. Of the data currently being created, it is estimated that 80-90% exists as unstructured data. There are techniques being developed to manage unstructured data, such as data mining, natural language processing (NLP), and text/noise text analysis. Search engines for web browsers are in many cases at the forefront of utilising these technologies to better sort and analyse unstructured data. However, because of the unstructured nature of the format in which the data are presented, unstructured data continue to represent a significant challenge for organizations looking to use data to build greater awareness and insight.

Whilst the techniques needed to manage and analyse unstructured data are dependent on technology it is important to remember the reason for the need to analyse this type of data. By developing an ability to work effectively with sorted and unsorted data, organizations can better understand their operating environments, and react accordingly. One must also remember the volatile and dynamic nature of most markets. Therefore, organizations must also consider the need for flexible and responsive IT systems. This shift in focus from a technology-driven to an information-driven organization will have a significant impact on the way technology is embedded across the organization. Davenport (1994) proposed a spectrum between a technology focus and what he saw as a more human-centred approach to information management. Davenport talks about the different approaches as being either an "information architecture" or "human-centred" approach.

In the case of "information architecture", Davenport focuses on the more systematic, technical aspects of designing and implementing IT systems. In the case of the "human-centred" approach, the focus is more on how the organization and its stakeholders need to access, and work with the data/information that flows through the organization's information systems.

Information Architecture	Human-centred Approach
Focus on computerised data	Focus on broad information types
Emphasise information provision	Emphasise information use and sharing
Assume the permanence of solutions	Assume the transience of solutions
Assume single meaning terms	Assume multiple meaning terms
Stop when the design is done or the system is built	Continue until the desired behaviour is achieved enterprise-wide.
Build enterprise-wide structures	Build point specific structures
Assume compliance with policies	Assume compliance is gained over time through influence.
Control user information	Let individuals design their own information environments.

Table 3.6: Comparisons between the Information Architecture and Human-centred Approaches

Not all of these characteristics will manifest at the same time, nor will it be likely that any organization exhibits only those characteristics from either an information architecture or human-centred approach. This table should be considered as showing two ends of a spectrum, and their alignment to the characteristics outlined in the table will decide where they sit on the spectrum.

However, Davenport (1994) is clear; those organizations that want to become better at managing and analysing their data need to develop a more human-centred approach to information management.

3.4.3 Moving from a Functional View to a Supply Chain View

Organizations understand that the supply chain is not simply a support function for their business, but is in fact the key capability against which a competitive advantage can be developed (Kulp *et al.,* 2003). An organization's supply chain capability is now regarded as a key contributor to any organization striving to maximise competitive advantage (Toyer, 1995), and no longer is the "supply chain" simply the preserve of procurement, logistics, or manufacturing specialists (Porter & Miller, 1985). As one would expect, technology plays a key enabling role in ensuring the flexibility and responsiveness of the supply chain. For the purpose of this chapter we will define a supply chain as follows:

A supply chain, logistics network, or supply network is the system of organizations, people, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform raw materials and components into a finished product that is delivered to the end customer. (Porter & Miller, 1985)

One way of thinking about supply chains is as the organization's engines to achieve the desired outcome of the core business model or models. Organizations may coordinate the activities of multiple supply chains that may share resources at various points along the chain.

Organizations in general, are well aware of the components that make up their supply chain; indeed, these components are often well established and embedded. However, many still struggle with the problem of effective component alignment (Day, 1994; Teece, 1998). Functionally aligned organizations may understand and individually manage their supply chain

components, but performance can only be maximised once they achieve the transformation to process alignment. Process aligned organizations focus on core process performance as opposed to functional business unit performance. This is a fundamental and key change for most organizations and one that they must make in order to fully develop their supply chain capabilities. However, this shift in focus does not come easily to many organizations, as internal business unit boundaries can be difficult to remove (Argote *et al.,* 2000). The problem is exacerbated within complex organizations where capabilities such as manufacturing, logistics, and procurement have been outsourced; as is now the case with many organizations.

However, for any complex organization managing the re-alignment of supply chain relationships, this activity must surely impact both immediate and future performance (Lee *et al.,* 1997; Troyer, 1995). Performance is not simply down to the implementation of elaborate IT systems (Kotter, 1995), but requires the alignment of key personnel in an understanding of the information and knowledge management practices as they relate to the end-to-end processes (Wiig, 1997; Tsoukas, 1996). This requires management to think about how the business operates from a process as opposed to a functional perspective (van Weele, 2002).

According to Lee (2003), for supply chains to be effective they must adhere to what he refers to as the three As. These are:

- **Agile**: Able to respond quickly to market driven changes.
- **Adaptable**: Flexible enough to be able to change without breaking.
- **Aligned**: To the organization's business models.

These three A's can also be used to broadly characterise any digital system. This is no accident as digital systems are fundamental to building and supporting complex supply chains, irrespective of whether they are delivering physical or digital products and services. One can think of the modern supply chains as information chains that enable the organization to sense and respond to changes in the markets.

Every supply chain will be different, and the way technology is employed to support the component core processes will certainly differ from organization to organization. However, what is important is the need to understand how information and knowledge are created, accessed, stored, interpreted, and shared along core business processes, and not just from an

organization-wide, functional perspective. When an organization looks at how information and knowledge are created and shared from a process perspective, as opposed to how they are created and shared from a functional (business unit/departmental) perspective, real performance improvements can be realised (Smolnik *et al.,* 2005).

For many organizations, a high degree of focus has been placed on technology in order to drive supply-chain performance. However, it is important to realise that technology alone cannot yet fully support all aspects of knowledge transfer (Marwick, 2001; Johannessen *et al.,* 2001) and an over dependency on technology can result in the tacit (human cognitive) aspect of knowledge creation being overlooked. Also, the knowledge and information requirements of employees will vary along the supply chain. Therefore, in order to drive improved end-to-end performance, sustainable results will be achieved when changes focus on improving the flow of information and the creation of knowledge along the supply chain. In particular, process improvements need to focus not just on codified knowledge systems, but also on personalised knowledge systems.

> **Codified Knowledge Systems:** Emphasise data capture, storage, and dissemination. These in turn are based on technologies, such as intranets, repositories, databases, etc.
> **Personalised Knowledge Systems:** Emphasise knowledge sharing among individuals, groups, and organizations through social networking and/or engaging in "communities of practice" or "epistemic communities" (Brown & Duguid, 2000; Hansen *et al.* 1999; Wenger, 2000).

In effect, supply chain organizations also need to be clear about where in the process different knowledge and information management systems need to be implemented. This cannot be done, especially in a complex organization, without directly researching the knowledge habits of the employees.

It is important, as a first step in developing a supply chain, to understand how employees utilise information at key points along the supply chain. By taking this perspective, organizations can better target potential barriers during core processes, and by so doing focus on changes that more effectively impact core process performance. Chapter 7 (Using Technology to Support Knowledge Transfer and Innovation) will discuss the importance

of knowledge management in developing competitive advantage, and how supply chains can be used to develop a sustainable capability in this area.

Time Out

Think about it: Building a Responsive Supply Chain

Anne Kulp, the CEO of Universal Programmable Devices Ltd. (UPD Ltd.), is looking to extend the business into Latin America. There is a growing demand for programmable technology devices to support an increasing demand for internet enabled technologies. Other original equipment manufacturers (OEMs) use the devices developed by UPD to embed into their products. Because of compatibility issues, it is important that UPD research and manufacturing processes can respond to compatibility issues and technical modification requests from the OEMs. The ability to do this in existing markets has allowed UPD to respond faster than the competition to changing customer needs. Up until now, UPD has not had any presence in the Latin American market, but increased interest in their products, and requests to scale up availability are growing. Anne and Dieter Haus (Sales Directors) are keen to start selling into this new and lucrative market. However, they want to ensure their costs are minimised whilst maximising revenues. As this will be the first market where UPD does not have a significant physical presence, other than small sales teams in each of the major cities and customer manufacturing sites, the company's existing supply chain models will not support this mode of engagement.

Dieter and Anne see the automation of a supply chain into Latin America as the most obvious option for minimising costs. They have talked to Lee Chang (CIO) about using IT to fully automate the core supply processes, and he has said building a technology system is possible, and will certainly help reduce costs along the core processes. As the operations manager, you have overall responsibility for the performance of existing and any future supply chains, including any into Latin America. Because of this you have been asked to give your opinion on the proposed option.

Questions:

- Considering the type of product being developed and sold by UPD Ltd., how rigid/flexible do you think the supply chain will need to be?
- How do you think a fully automated supply chain will support the need to be responsive to changing customer needs?
- Should the design and development of an automated supply chain be left solely to the IT department? Who should be part of this design and development process?
- Is cost saving the only advantage that technology can bring to the supply chain? What about information transfer? Which of these is more important to the business, and why?

3.5 Assessing the Impact of a Digital Approach

When embarking on any change, whether disruptive or incremental in nature, it is important to be able to assess the impact and value that the change will bring to the organization. Organizations looking to develop a "digital approach" need to be aware of the changes, both positive and negative, that will have an impact on their ability to compete.

Because the implementation of digital enabling technologies is designed to support core business models, the point in the organization at which the technology is deployed may not be where the value will be realised. For example, an organization might decide to develop an internal cloud solution. The cost of development, deployment, and ongoing management may come out of the IT function's capital and operating budget. However, the cloud solution might see an improvement in the quality and visibility of vendor supply levels, the adoption and deployment of new business-critical software, or simply a more transparent view of the organization's own performance data. Another example might see the IT function developing a Hadoop database for working with real-time data flows. Once again, the cost of maintaining the database, building and maintaining the data feeds, and employing programmers with the necessary skills to write analytical algorithms, may rest with the IT function. However, the ability to better analyse market and operational data may improve the product's time to market, supply line issues, and customer relationships.

In effect, organizations must be able to properly assess the impact that current and new technologies will have on performance at an organizational level. When considering the increasing cost in the deployment of any organizational-wide information system, many organizations cannot afford to misjudge how such a deployment will impact their operational capability. This is not a new problem, with many organizations realising the importance of an end-to-end view of IT project implementation. In the late 1990s and the early part of the 21st century, organizations needed to manage many "enterprise system" implementations. These included systems such as customer relationship management (CRM) systems, enterprise resource planning (ERP) systems, and e-commerce enabled order management systems. Although these systems were expensive in terms of both implementation and deployment, they were expected to support the organization for a number of years once they were rolled out across the organization. However, the rate of change and the increasing level of competition mean that organizations need to be able to react faster to changing opportunities and threats. This will mean technology will need to support more flexible and responsive business models. Therefore, organizations are now required to implement and deploy complex information systems in much shorter time frames, otherwise they risk the chance of being overtaken by their more technologically enabled competitors. This is posing a significant challenge for many organizations as a requirement to implement the latest technologies needs to be weighed against the risk of a failed implementation – the financial cost alone of such a failed implementation could result in the organization's inability to continue to compete effectively within its chosen market.

3.5.1 Understanding the Complex Nature of Modern Organizations

Complexity in today's modern organization is being driven by the need to manage increasingly complex supply chains or supply networks. Organizations no longer find themselves in a position where they control all aspects of manufacturing and delivery, such as from owning the raw materials right through to the physical delivery of goods and services to the end customer. Instead, organizations now operate as part of a complex supply chain or network. As demand patterns change, the organization needs to be able to competitively re-position itself within its network. This may require aligning and partnering with new supply-chain or network partners. This, in turn may result in the need to modify or significantly

change existing IT systems. This need for flexibility and speed in response will determine if an organization can continue to remain viable.

However, not all of the factors shaping the complexity of modern organizations are simply down to changing market forces. Some of the more common factors driving complexity in business model design and supply chain implementation are as follows:

- **Technology integration (legacy and new):** Many organizations are restricted in their ability to respond due to the need to manage existing IT systems, and the need to adopt and integrate new technologies that are sometimes incompatible.
- **Global reach – local relationship**: Having a global reach enhanced through the use of internet technologies is no absolute guarantee of success. Many organizations realise that customers require a "local" feel to the provision of some products and services.
- **Geographical reach of the supply chain:** How far and how fast does the organization need to reach into a geographic region? Can it use local partner vendors, or does it need to extend its own controlled supply chain operation into that region?
- **Shift in focus from a product to a customer focus**: Organizations can't compete on price alone. Developing a sustainable customer relationship based on experience is less susceptible to price-based competition. How can an organization build a sustainable relationship with its customers in online markets?
- **Managing multiple expectations (suppliers and customers):** Organizations are now generally part of larger supply networks, where every other organization will have its priorities (including customers, and strategic objectives). Organizations need to manage these differing priorities if they are to present a responsive front to their own customers.
- **Organizational (mis-)alignment:** As organizations face changes within their respective markets, some parts of the organization, usually the customer-facing functions, may change faster than others. This may cause misalignment in terms of objectives and how different functions interact with each other.
- **Demographic of the skilled workforce:** The requirement to develop and build new products and services will require different skill sets. These may, or may not be locally available. Certainly, in the case of certain technology-based skills, these can tend to gravitate to locations such as the UK (finance), the Czech Republic (supply chain), Belgium

(telecoms), India (software development), etc. Does an organization relocate to the skills base, outsource the requirement to a third party, try and influence core skills away from the main skills centres, or develop the necessary skills locally?

- **Managing the impact of global competition:** Organizations constantly have to look at different innovative ways of developing, marketing, and delivering new competitive products and services. We will look at the role of technology in supporting the innovative process in Chapter 10 (Information Systems for Business Processes).

There are many examples where organizations have failed to successfully transition through these market driven changes. It is important to realise that whatever made organizations successful in the past is no longer an indication of what will ensure success in the future. The constant state of flux within global markets needs to be continually monitored and analysed and the appropriate response made. However, in many cases the issues and challenges being faced will be unique to the organization. To that end, there is no framework or automated process to be initiated. Success or failure will depend on the organization's ability to read the situation correctly, understand the main influencing factors, and have the right information and knowledge to make the correct decision. This will ensure that data and information can be better accessed through the adoption of "digital" enabling technologies.

3.5.2 Digital Support for Organizational Success Factors

The complex nature of organizations and how they now need to constantly align and re-align themselves with their competitive environment mean that the defining aspects of what makes a successful organization are changing. Organizations that would have felt secure in their market position at the end of the 20th century, are now constantly having to re-invent themselves, and fight for market dominance with organizations that are smaller, more responsive, cost-efficient, technologically savvy, and less hindered by cumbersome IT legacy systems.

There is an acceptance within industry and academia that the factors that once made organizations successful have changed. Organizations in the latter half of the twentieth century relied on size, role clarity, specialization, control and product focus, but these no longer assure market dominance. To

operate successfully in the highly dynamic and competitive global market place, organizations need to focus on a different set of success factors; namely size, flexibility, integration, innovation, and client or customer focus (Harryson *et al.,* 2008; Al-Mashari *et al.,* 2003; Panayides, 2006). Table 3.7 outlines the shift from old to new success factors as originally presented by Ashkenas (2002). These new success factors have been augmented with "client" as a critical focal point for any knowledge intensive service industry.

Old Success Factors	New Success Factors
Size	Speed
Role Clarity	Flexibility
Specialisation	Integration
Control	Innovation
Product/Service Focus	Client

Table 3.7: Old and New Organizational Success Factors

- **From Size to Speed:** The size of an organization is no longer an indicator of its ability to respond to changing forces and needs within a market place. For organizations to be successful they must be able to sense and respond quickly to shifts in customer demands.

- **From Role Clarity to Flexibility:** Organizations need to be able to build and operate flexible and responsive business models. In order to make this happen the organization must be open to supporting new missions and objectives. If the organization is fixed in terms of role clarity this may prevent the timely engagement of parts of the organization in new ventures and customer focused initiatives.

- **From Specialization to Integration:** This does not imply that specialists are no longer a necessary component within the modern organization. What this means is that organizations that integrate employees into multi-disciplined teams achieve greater success in developing relevant products and services than if they leave the same work to teams made up of specialists from within the same discipline.

- **From Control to Innovation:** Organizations that exhibit rigid control structures may find it difficult to encourage and capture innovative ideas from their employee workforce. The perception that ideas flow down and not up may prevail. This will in effect numb the organization's ability to directly sense what needs to be done to identify and respond to changing client or customer demands.

- **From a Product/Service Focus to a Client Focus:** many would advocate that the Henry Ford approach to customization is dead (…any colour as long as it's black). However, many organizations still persist in developing products and services without direct input from customers and clients through the product/service development cycle. Organizations that focus on the client through this process are more likely to produce a product or service that is in tune with the client or customer's needs.

IT is widely used to support all five new success factors. However, this is not always done in a connected, strategic fashion. Table 3.8 shows some of the ways that technology is being used to support new success factors. This table also shows how a "digital" perspective can help to develop a more connected, customer-focused approach.

Success Factor	Current Role of IT	A Digital Perspective	Example
Speed	Improving order management/fulfil ment	Focus on improving the response to client needs, and improving the product/service time to market/client	Website enables a customer to track order status in real-time (DHL, UPS). Allows real-time stock checking and availability via interactive websites. (Amazon, Dell)
Flexibility	Providing customization and personalization support	Use technology to build flexible and responsive core business processes	Customised order payment and delivery options via the website. A customer can use mobile devices to select the time/place and who can receive delivery of online purchases (Amazon, DHL).

Integration	Ability to integrate supply chain/strategic partner systems	Use technology to support collaborative working across the entire organization, and identify and allocate resources (people, finance, technology) where needed	Use internet technologies to allow customers to compare prices of similar products across a range of suppliers (gocompare.com).
Innovation	Using web-based technologies to improve customer/client experience	Use technology to focus on facilitating, capturing and sharing innovation around core processes and NOT just within business units/functions	Using search algorithms to select items of potential interest to customers, and presenting them as recommendations (Netflix, YouTube).
Client	Developing CRM systems	Use technology to drive "client" focus and not "products/services" as a priority throughout the organization	Using technology to ensure trust in online payments (PayPal).

Table 3.8: IT and Organizational Success Factors

The way in which technology is being used (Table 3.8) does not necessarily demonstrate a customer-focused, or environmental sensing approach. A paradigm shift is required in the way the organization views and utilises its IT resources. Many organizations still think of their IT resource as a cost to be borne for managing and channelling information around the enterprise. However, this view needs to change (McLaughlin, 2012). IT should not just be seen in terms of its impact on cost, but on its impact on business value. In essence, how does technology directly impact the critical success factors in a way that improves the service provided to a customer by an organization? The "digital perspective" column in Table 3.8 takes a look at how organizations should view technology in terms of the service it can deliver from a critical success factor perspective.

3.5.3 Assessing the Value of Digital to the Organization

As pointed out in this chapter, adopting a "digital perspective" is about taking a view of IT that is less technology, and more information focused. Understanding how technology can be used to support individuals in their work, not just from a functional perspective, but how they need to interact and manage complex cross-functional supply chains, is vital for ensuring core business processes remain flexible and relevant to building competitive advantage. Understanding technology's role in helping to improve an organization's ability to adopt and develop new success factors will see the formation of a more responsive and market-aware organization.

This means that while developing a digital perspective is important, assessing the success of any digital enabling initiatives can be difficult due to the organization-wide impact that these initiatives may have. As such, organizations are increasingly undergoing digital transformations that go well beyond the domain of any individual business function (marketing, finance, sales, IT, etc.). Increasing digital capability can provide tangible benefits in every area of the organization, including:

- The senior management team can visualise and quantify how digital transformation will make the business more cost effective and competitive.
- Finance departments can learn how digital technologies such as cloud computing can significantly reduce IT costs.
- Procurement departments can develop a better understanding of the digital landscape in order to source the best solutions.
- HR departments can start recruiting in ways that make the organization attractive to digitally savvy candidates.
- Marketing departments can decide which communications channels are best to exploit – the web, social media, mobile or perhaps a multi-channel approach
- Sales departments can improve the customer experience by deciding which products and services should be delivered online.

- Customer service departments can harvest customer generated content such as feedback from online user forums and integrate these with CRM systems.

- Research departments can leverage web analytics software, which makes customer profiling increasingly more powerful and accurate.

To understand how digital initiatives are adding value, organizations will find it helpful to look at "digital" in the context of delivering better staff performance, customer service and quality of products and services. Initiatives can then be assessed for their ability to deliver a better financial performance (O'Hea, 2011).

Time Out

Think about it: Going Digital – An Organizational Challenge

Aquila Management Systems (AMS) Ltd. is a medium-size management consultancy firm specialising in IT, finance, and HR management services. AMS has been in existence since 1989. Business has been good for the last 4-5 years, but the company can't quite break through to providing services for the better-known global brands. AMS seems destined to provide its services to medium-sized clients. Amir Khan (CEO) knows that the profit margin in the large enterprise (LE) sector is better than that of the small to medium sector, and that with LE engagements will come greater awareness for his company amongst the global brands. Amir has started to notice that there are some new competitors in the market who have managed to get into some of the global brands he's after. So, this level of success cannot be down to size, or time served in the industry.

Amir calls the management team together to ask why this is happening. What does AMS need to do to get back in the race? "Certainly, technology can't be the answer", says Amir. "We've just spent a small fortune updating our CRM, and billing systems." The other senior managers, including the IT manager are at a loss for words. Bill Smith (Head of HR Services) finally speaks up. He says "…it's really hard to know off the top of our heads what to do…we don't meet together like this that often, so I don't really know what the other Heads of Services think need to happen". Carol Chen (Head

of Financial Management Services) makes the observation that "individually, we run our services very successfully, with a consistently high level of consultant utilisation. However, as services we don't seem to be able to collaborate very well on the more complex type of bids large enterprise firms submit for tender".

Amir ponders this last point. At one level he is relieved, as he has all the expertise and skills required to provide services to LE clients. However, on the other hand, AMS can't seem to coordinate the activities or the different service groups to meet the more complex needs of the LE clients. Amir also realises that for the last 4-5 years (maybe even longer) he has been focused on building in size (employee numbers and locations), and presenting a specialised set of service offerings. Also, all of the Heads of Services have been driven to build service groups and return revenues against targets specifically linked to their service groups.

Amir now turns to you, as the Head of IT Management Services, and says "I know we already have new IT systems supporting the business, but can we use our IT to improve our competitive positioning?"

Questions:

- What must Amir and the team now focus on in terms of organizational success factors?
- How can technology support the key success factors you choose to develop?
- When you consider the factors shaping the complexity of the organization, how do you think these factors will influence how IT can be used to improve overall organizational performance?

3.4 Learning Summary

The term "digital" is being used to describe how technology can be utilised to develop a competitive position for organizations. Up until quite recently, IT has been seen as a cost-centred activity for most organizations. However, with the advent of faster internet speeds and access, the low cost of storage, and an increase in the number of internet

enabled devices, organizations are becoming increasingly aware of the changing role of technology in building more flexible and responsive organizations.

Advances in technology are having an interventional impact on both organizations and global competition. This means that technology is creating both opportunities and threats for organizations. Therefore, many organizations are being forced to reconsider how they use technology if they are to stay in competition with other businesses while operating within the new and hyper-competitive global markets.

Fundamental to the notion of a digital organization is the ability to sense and respond to changing customer needs. The ability to react to what is happening in a business' chosen market place will be a determining factor in the ongoing viability of that business. This makes a very clear and explicit link between digital enablement and the need to more effectively manage internally and externally generated information for the purpose of improved and expedient decision-making across the organization. This reprioritises "information", as opposed to "technology", as the critical focus for IT. A failure to make this focus shift will result in two very different types of IT support structures being put in place across the organization. These are either an "information architecture" approach or a "human-centred" approach. How end users, customers, and partners access, create, and share information becomes very important if the organization is to continue to provide value to the customers (be they internal or external). Therefore, a "human-centred" approach to IT implementation can help to develop a more information-aware organization. How technology is used to achieve this can be considered as a digital implementation.

The increased ease of access to internet technologies has led to many organizations re-thinking their core business models. The need to sell to and engage with customers via physical and internet channels has increased the dependency on IT. However, because of the dynamic and changeable nature of these new markets, core business processes must remain flexible and responsive to changing customer requirements. Therefore, focusing on the technology alone will not suffice. How technology is used to engage with and capture user/customer insight becomes an imperative for organizational survival and competitive positioning.

Another key aspect of "digital" is that any technology implementation must consider what the organization needs to become successful. If the

technology being implemented does not support the desired success factors (speed, integration, flexibility, innovation, and the client) that are necessary to improve customer and market insight and overall performance, then it cannot be truly considered to be a digital implementation.

3.7 Case Study: PRISA Going Digital

PRISA is a Spanish media conglomerate founded in 1972 by Jesus de Polanco. The company's commercial interests cover television, radio, publishing, and the press. As of 2015 the company owned three national news and sports papers and six magazines, as well as over 15 radio stations and four TV stations. As the main language for the organization is Spanish, the main markets for its products and services are Spain, Portugal, Argentina, Chile, and Columbia. PRISA currently employs approximately 15,000 people across all of its lines of business.

From about 2008 the organization realised that many of its traditional products and services were under threat from alternative products and services being delivered via the internet. The senior management team quickly came to the conclusion that they would not survive if they didn't change the way they engaged with their markets. The management team understood the value of well implemented technology, yet they also knew that transforming the business was not just about keeping up with the latest technology, but about building a sustainable and realistic technology-enabled business model.

As PRISA is a conglomerate of largely autonomous organizations, coordination of the digital transformation would need to be managed centrally. The then CEO, Nicolas Berggruen, initiated a centralised digital unit to help each part of the organization to stay in step throughout the process of the transformation. In order to ensure the digital transformation had a boardroom focus, the CEO appointed a global Chief Digital Officer (CDO) reporting directly to the CEO, who had overall responsibility to see through the digital transformation across the entire organization.

In order to ensure the digital transformation was being successfully implemented across all the different lines of business, a new role was

created for each separate business unit: Chief Digital Officer (CDO). Each CDO had a reporting line to their respective line of business CEO, and the global CDO.

In order to drive a consistent, well-communicated vision of where PRISA needed to go, and what the organization would be focusing on, the digital transformation was designed around four key transformational pillars. These pillars can be defined as follows:

- **Creating a federated digital organization**: The focus is to create a digitally enabled organization without adversely impacting the business' ability to sense and respond to the challenges of its respective markets.
- **Building digital skills**: This would require identifying and sourcing new skills and expertise from outside the organization, as well as developing new skills within the existing employee workforce.
- **Optimisation of resources**: Digital distribution channels and resources would be used to identify new revenue streams and to improve the sharing of key resources across the entire organization.
- **Using technology to support innovation**: This encourages the use of new technology in the development of innovative business processes and services.

The organization monitors the progress of the transformation through a set of clearly defined and communicated key performance indicators. The management team sees the transformation as an ongoing journey. To say the transformation is complete at any stage would be to define a steady state and fail to understand the dynamic nature of the competitive market.

PRISA has had to re-configure many of its traditional businesses through the process of transformation. The opening up of new channels (online digital media) has meant that many traditional ways of doing business have changed. For example, the traditional TV service is moving to a more interactive model with digital technology providing consumers with more control over what they watch, and how they can interact with programmes in real time. Book publishing is also changing. No longer is there a need for long lead times for the physical printing of books. Digital books can be scaled instantly to meet changes in demand, without the need for physical

distribution channels. In order to support this new way of doing business, PRISA is working with new technology partners to deliver any type of content anywhere, anytime, and onto any platform.

As PRISA drives on with its transformational efforts, the main challenges have been around cultural resistance, keeping the different businesses in step with the changes, identifying and building the digital skills necessary for now and the future, and lastly, building confidence across the organization to experiment with new technology, and build new innovative products and services. Despite these challenges, the management team at PRISA sees the digitally enabled organization as being a prerequisite for expanding their business into other European countries, and South America.

Questions:

How do you think the digital transformation will support the development of "new" organizational success factors?

PRISA is working to change its core processes from "adaptive processes" to "intelligent processes". This brings with it a crisis of complexity (Thomas *et al.,* 2013). How do you think this crisis of complexity is manifesting itself?

What can PRISA do to reduce the impact of the "crisis of complexity" that they are experiencing through the transformational process?

How do you think PRISA's digital transformation will support the development of the following capabilities?

- Flexible business model development.
- Improved decision-making.
- Improved cost of quality and scale.
- Improved customer engagement experience.
- Dynamic vendor coordination.
- Improved market analysis.

3.8 Review Questions

True/False Questions

3.1 The term “digital” relates only to internet enabled technologies. T or F?

3.2 “Digital” is just about taking cost out of IT management. T or F?

3.3 “Digital” is about improving competitive advantage. T or F?

3.4 “Digital” is something that all parts of the organization need to be involved with. T or F?

3.5 “Digital” is about providing access to information that will enable timely and cost-effective decision-making. T or F?

3.6 The cost curve profiles for digital and physical products are the same. T or F?

3.7 All business functions will view the challenge to create a digital organization in the same way. T or F?

3.8 New digital technologies are changing the way organizations view and interact with data. T or F?

3.9 Prime-mover advantage will assure dominance in a dynamic market place. T or F?

3.10 Taking a digital perspective will help organizations build responsive business processes. T or F?

3.11 Taking a digital perspective will require organizations to think differently about technology. T or F?

3.12 The challenges facing organizations implementing digital enabling technologies affect all modern organizations equally. T or F?

3.13 Organizations seeking a stronger performance based on digital enabling technologies need to change the way they approach the design and delivery of IT services. T or F?

3.14 Ensuring the efficiency of services is the main performance metric for digital enabling technologies. T or F?

3.15 Deciding on and implementing digital enabling technologies should be left to the IT professionals. T or F?

3.16 “Going digital” is really just about adopting the latest digital enabling technologies. T or F?

3.17 Digital enabling technologies can provide effective systems for analysing customer and market data. T or F?

3.18 Organizations only need to become better at analysing structured data. T or F?

3.19 The ability to reach out to customers through social media is changing the way new products and services are being developed. T or F?

3.20 What is driving the need for more “intelligent processes” is a “crisis of rigidity”. T or F?

3.21 The implementation of digital enabling technologies will not impact the way people work. T or F?

3.22 Digital enabling technologies are best employed for the main customer interfacing parts of the organization. T or F?

3.23 The greatest contribution that information makes to an organization is its ability to remove cost from the business. T or F?

3.24 Information creation is one of the main challenges for information management today. T or F?

3.25 Unstructured data account for up to 50% of all data types. T or F?

3.26 Information architecture is focused on how individuals work with information as opposed to technology. T or F?

3.27 How employees utilise information at key points along a supply chain is important when considering how IT can be used to support the supply chain. T or F?

3.28 Developing flexible and responsive IT systems is necessary for competitive positioning. T or F?

3.29 Generally speaking, what has made the organization successful in the past will continue to make it successful in the future. T or F?

3.30 Size and specialisation are sure key success factors for today's organization. T or F?

Multiple Choice Questions

3.31 Which of the following technology advancements does not directly cause an increased level of demand for technology utilisation?

A. Faster broadband
B. Increased wi-fi availability
C. Reduced cost of storage
D. Improved software quality

3.32 Which of the following is not considered a digital enabling technology?

A. Cloud
B. Big data
C. Mobile
D. Fibre optics

3.33 Which of the following is not an internal influencing factor driving organizations to consider digital enabling technologies?

A. Need for improved customer engagement
B. Reduced cost of technology
C. Growth of global competition
D. Existing technology deployment

3.34 Which of the following is not a key performance metric for deployed digital enabling technologies?

A. Efficiency
B. Cost
C. Security
D. Quality

3.35 Which of the following elements helps to re-focus IT functions towards developing a digital organization?

A. Effective communications
B. Open innovation
C. Focus of data analytics
D. All three

3.36 Which of the following characteristics helps define online global markets?

A. Markets are unstable
B. Markets are fast moving
C. Markets are easier to move between
D. All three

3.37 Which of the following is not a core capability for building a digital organization?

A. Flexible business model development
B. Improving customer engagement
C. Improving market analysis
D. Improving IT service desk problem management

3.38 Which of the following is not a stage in process evolution?

A. Ad hoc
B. Repeatable
C. Accessible
D. Intelligent

3.39 Which of these challenges is not associated with managing a large data set?

A. Volume
B. Variety
C. Verbosity
D. Validity

3.40 Which of the following is not a characteristic of a human-centred approach to information management?

A. Focus on broad information types
B. Emphasis on information provision
C. Assuming the transience of solutions
D. Assuming multiple meaning terms

3.41 Which of the following is not a characteristic of an effective supply chain?

A. Able
B. Agile
C. Adaptable
D. Aligned

3.42 Which of the following is not a "new" organization success factor?

A. Speed
B. Size
C. Flexibility
D. Innovation

3.43 Which of the following best describes the overall percentage of data that are unstructured?

A. Approximately 10 to 40% of all data is unstructured
B. Approximately 40 to 60% of all data is unstructured
C. Approximately 60 to 80% of all data is unstructured
D. Approximately 80 to 90% of all data is unstructured

3.9 Review Question Answers

True/False Answers

3.1 F, 3.2 F, 3.3 T, 3.4 T, 3.5 T, 3.6 F, 3.7 F, 3.8 T, 3.9 F
3.10 T, 3.11 T, 3.12 F, 3.13 T, 3.14 F, 3.15 F, 3.16 F, 3.17 T
3.18 F, 3.19 T, 3.20 F, 3.21 F, 3.22 F, 3.23 F, 3.24 F, 3.25 F
3.26 F, 3.27 T, 3.28 T, 3.29 F, 3.30 F

Multiple Choice Answers

3.31 D, 3.32 D, 3.33 C, 3.34 B, 3.35 D, 3.36 D, 3.37 D
3.38 C, 3.39 C, 3.40 B, 3.41 A, 3.42 B, 3.43 D

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Chapter 4: Building a Digital Business Strategy

Learning Objectives

By the end of this chapter you will be able to:

- Identify the core components of a digital business strategy.
- Describe how a digital business strategy differs from a corporate business strategy.
- Describe the core difference between an IS and a digital business strategy.
- Explain how an organization can ensure alignment between the corporate strategy and the digital strategy.
- Explain how a digital business strategy can help to build competitive advantage for an organization.
- Describe how a digital business strategy can contribute to building business value.
- Describe how an organization can develop a consistent and integrated approach to developing a digital business strategy.

4.1 Introduction

What is involved in developing a digital strategy and how does it differ from the more traditional IS strategy? In many ways, the digital strategy should continue to address the issues of IS–business strategy alignment (see Chapter 2: IS and Business Strategy Alignment). However, this new paradigm brings with it new ways of looking at how technology needs to be managed, and who now needs to be part of the development process. This chapter will identify how to look at the core components of what is meant by "digital" and how to assess their importance against the overall business strategy. The chapter will also look at methods for assessing the readiness of an organization for digital enablement, and what this will mean in terms of the impact that any proposed transformational changes will bring.

4.1.1 Corporate or Digital Strategy: What's the Difference?

The ultimate goal of any digital strategy is to optimise the integration of technology in a way that facilitates the achievement of core strategic objectives. In many ways, the notion of a digital strategy is simply the achievement of the overall corporate strategy through a holistic integration of technology. It could be argued that an effective corporate strategy for any organization looking to bring timely and relevant products and services to customers, wherever they are, is fundamentally a digital strategy. In Chapter 2 the concepts of knowledge management, information management, information systems, and IT strategy were discussed. All four of these concepts are integral in deciding how technology needs to be integrated within the organization. However, the concept of what technology is, and what it can do for the organization is at the core of all four areas of technology strategy. The challenge for organizations is ensuring that these four components are aligned to what the organization actually needs in order to achieve its strategic objectives. This challenge of alignment between what the business needs and what technology can provide is constantly present.

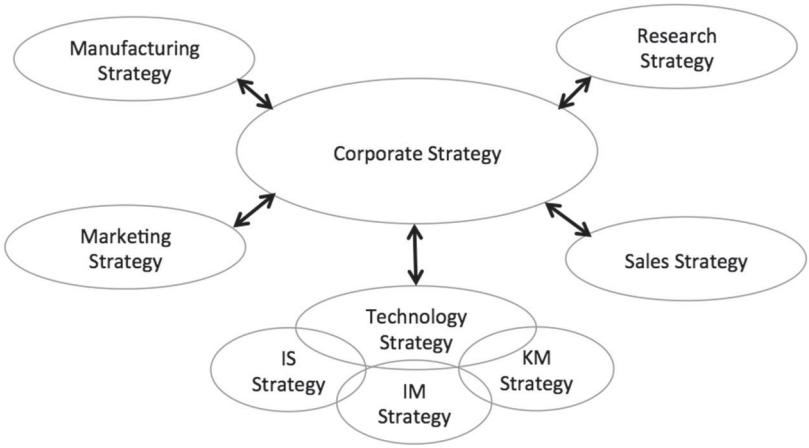

Figure 4.1: Strategy Alignments

Figure 4.1 provides a visual representation of the way that strategic planning and development may manifest across a typical organization. The formation of an overarching corporate strategy will be used to inform and develop other functionally aligned business unit strategies, such as strategies for

marketing, sales, HR, manufacturing, etc. The overall desired effect is that the business unit strategies align with the overarching corporate strategy, and provide a way of realising core strategic objectives. One of the supporting strategy areas will be concerned with how technology is being used to support the overall objectives of the organization. As shown in Figure 4.1, the focus and scope of the technology strategy will be driven by the importance placed on the information system (IS), knowledge management (KM), and information management (IM) components by the organization as a whole. The IT strategy, as discussed in Chapter 2, is seen more as an operational plan for the deployment of technology, and not really a contributing factor in the overall strategic planning process for shaping how technology will support the organization in reaching its core business/strategic objectives.

Recent advances in technology are fundamentally changing the competitive landscape in nearly all industrial sectors. Access to technology has increased the number of competitors now vying for customers in a truly global market. Organizations have to modify and expand their portfolio of products and services to stay in tune with their customer needs. For example:

Tesco – From groceries to mobile phones
Ryanair – Low cost flights to credit cards
Amazon – Book distribution to book publishing
Apple – Computers to media streaming
Nokia – Forestry to mobile phones
Brother – Sowing machines to printers

In order to stay competitive and relevant in a fast-changing market, organizations have to get better at sensing and responding to the needs of existing and future customers. This demands a more responsive and flexible organizational infrastructure. The responsibility is firmly with the senior management team to make the right strategic decisions concerning the market segments to be monitored, the product mixes to be developed, and how the organization needs to be structured and aligned to support any new business models. It is important to note that technology will not turn a badly thought out strategy into a good, effective strategy, but if technology is not considered as part of the overall strategic plan then the organization's ability to react to customer needs and changing market forces will be seriously impacted. Therefore, the corporate strategy must consider how technology can help to achieve the following:

- Improve the way we connect with our customers.
- Improve the way our employees connect into our information systems.
- Enable our employees to work in the way that best suits them.
- Better understand what our customers actually want from us.
- Turn concepts into actual products and services that we know our customers will want.
- Better understand what opportunities and threats exist in our highly dynamic markets.
- Improve the way we openly collaborate between internal groups, and with our customers.
- Deliver our products and services in an innovative way to our customers.
- Improve our supply chain performance.
- Improve overall organizational performance and competitive advantage.
- Develop a unified approach to improving performance, and to decide who will be responsible for owning our "digital" implementation.

As discussed in Chapter 3 (From IT to Digital), these questions are ones of enablement, and senior decision-makers in all organizations should ask these questions of their respective organizations. However, these questions are by no means extensive and all-inclusive. As senior management consider these questions, they also need to consider what part technology will play in answering any/all of these questions. An example of how technology can help inform the answers to these questions is outlined in Table 4.1 below.

	Question	Technology Enablement and Considerations
1	Improve the way we connect with our customers?	User interface design, Channel strategy, Systems compatibility.
2	Improve the way our employees connect into our information systems?	User experience design, VPN, BYOD, Security policies.
3	Enable our employees to work in the way that best suits them?	User experience design, VPN, BYOD, Security policies.

4	Better understand what our customers actually want from us?	Social media, Data analytics, Information management, Digital marketing.
5	Turn concepts into actual products and services that we know our customers will want?	Wikis/Collaborative workspaces, Computer modelling, Info security.
6	Better understand what opportunities and threats exist in our highly dynamic markets?	Data analytics, Information management, Market awareness via social media.
7	Improve the way we openly collaborate between internal groups, and with our customers?	Social media, Secure cloud technologies.
8	Deliver our products and services in an innovative way to our customers?	e-commerce technologies, Digital download technologies, CRM.
9	Improve our supply chain performance?	Technology enabled or core supply chain processes. Data analytics, Metrics tracking.
10	Improve overall organizational performance and competitive advantage?	Technology enabled or core supply chain processes. Data analytics, Metrics tracking. HR performance management systems. Data visualisation and dashboard technologies.
11	Develop a unified approach to improving performance, and to decide who will be responsible for owning our "digital" implementation?	Data analytics, Data visualisation and Dashboard technologies.

Table 4.1: Technology Enablement and Considerations

The manner in which organizations use technology to answer these questions will vary. Different organizations will identify different technology enabled solutions for each of these, and other questions. It is important to realise how necessary it is to consider how technology can be used to answer these questions. In effect, the conversation relating to how

technology supports the business is no longer an IT functional conversation. These questions relate to "business" issues, which in turn relate to the overall ability of the organization to achieve its core strategic objectives. It is also important to ask, who across the organization do these questions, and their answers relate to?

	Question	Who's Asking the Question?
1	Improve the way we connect with our customers?	Sales, Marketing, R+D, Finance, Product Development, Operations.
2	Improve the way our employees connect into our information systems?	All Org Functions.
3	Enable our employees to work in the way that best suits them?	All Org Functions.
4	Better understand what our customers actually want from us?	Sales, Marketing, Manufacturing, Finance, R+D.
5	Turn concepts into actual products and services that we know our customers will want?	Sales, Marketing, Manufacturing, Finance, R+D.
6	Better understand what opportunities and threats exist in our highly dynamic markets?	Sales, Marketing, Manufacturing, Finance, R+D.
7	Improve the way we openly collaborate between internal groups, and with our customers?	All Org Functions.
8	Deliver our products and services in an innovative way to our customers?	Sales, Marketing, Manufacturing, Finance, R+D, Logistics.
9	Improve our supply chain performance?	All Org Functions.
10	Improve overall organizational performance and competitive advantage?	All Org Functions.
11	Develop a unified approach to improving performance, and to decide who will be responsible for owning our "digital" implementation?	All Org Functions, Senior Management Team.

Table 4.2: Internal Digital Stakeholders.

What we can see from Table 4.2 is that multiple stakeholders can ask any of these questions across all the business functions of an organization. In effect, the decisions relating to how technology is deployed and utilised are no longer simply the responsibility of those in the IT/IS function. The level of importance that each part of the organization places on answering these questions will vary from organization to organization. However, the challenge remains for organizations looking to improve the integration and impact of technology. In essence, the high-level question that dominates the effective alignment of technology is:

How can we ensure we deploy technology in a way that allows the different parts of the organization to operate in a more integrated and cohesive manner without adversely impacting the organization's ability to sense and respond to changing customer demand and market forces?

This is fundamentally, what a digital strategy is expected to achieve. The technology strategy remains the enabler for the corporate strategy, but the corporate strategy must explicitly consider how technology can be better utilised and coordinated across the different functional strategies.

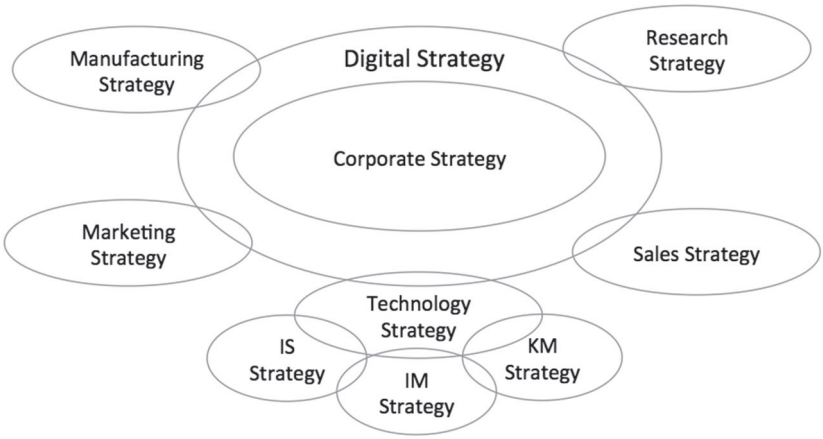

Figure 4.2: Strategic Landscape with a Digital Component

Figure 4.2 shows how the notion of a digital strategy fits within the organization's strategic landscape. The digital strategy does not replace the

need for any of the functional strategic plans (marketing, manufacturing, etc.). However, what it does is introduce the need for all strategic plans to consider how digital technologies can be used to implement and support their respective strategic plans. The focus of the technology strategy (whether it is IS-, IM-, or KM-dominant) will be to support the enablement of the corporate and functional strategies through a holistic technology implementation and integration plan.

4.1.2 From an Information Systems Strategy to a Digital Strategy

Since the 1980s, the prevailing view of the IT and IS strategy has been a functional-level strategy that must be aligned with the organization's corporate strategy. In essence, this was a one-way relationship, with business providing direction to the IT/IS strategy (Bharadwaj *et al.,* 2013). During the last decade, the business infra-structure has become increasingly more technologically dependent with increased interconnections among products, processes, and services. Across many firms spanning different industries and sectors, digital technologies (viewed as combinations of information, computing, communication, and connectivity technologies) are fundamentally transforming business strategies, business processes, firm capabilities, products and services, and key inter-firm relationships in extended business networks. Accordingly, Bharadwaj *et al.* (2013) argue that the time is right to re-think the role of the IT/IS strategy, from that of a functional-level strategy, aligned but essentially always subordinate to a business strategy, to one that reflects a fusion between the IS strategy and the business strategy. It is this fusion that Bharadwaj *et al.* (2013) term the digital business strategy.

Once again, it is important to remember that the development of a digital strategy does not replace or negate the need for an IS strategy. As a reminder, the definition of an IS strategy from Wilson (1998) is:

An information systems strategy brings together the business aims of the company, an understanding of the information needed to support those aims, and the implementation of computer systems to provide that information. It is a plan for the development of systems towards some future vision of the role of information systems in the organization.

(Wilson, 1998)

The focus on business alignment is explicitly called out in the IS strategy definition. To better understand how a digital strategy fits within an organizational context it is important to try and understand the changing dynamic between what the organization wants to achieve strategically, and what technology can now delivery. A well-executed IS strategy that is aligned to the business requirements will deliver value in terms of process efficiency and effectiveness. This is a model that has supported the competitive positioning and performance of most successful organizations over the last few decades. Examples of organizations that have benefited from an aligned IS/corporate strategy are:

Seven Eleven – Improved supply chain performance
IBM – Improved supply/Demand planning for PC manufacturing
Ford – Improved manufacturing processes
Wal-Mart – Improved stock control/management
Dell – Improved internet sales/e-commerce capability
BBC – Developed internet channel/iPlayer application

All of the organizations in the example above have successfully used technology to realise their strategic intent and objectives. The success realised by these organizations has also been dependent on a clear, realistic, and well-thought-out corporate strategy; the successful implementation of this strategy being dependent on an aligned IS strategy. However, the competitive environment is continuously changing and, therefore, requires organizations to become faster at sensing and responding to these changes. As a catalyst for many of these changes, transformational technologies such as cloud, mobile devices, data analytics, social media, the internet of things, etc., need to be understood not only in terms of the technology, but also their ability to transform the competitive nature of the environments in which they are introduced. These new technologies don't just improve the operating efficiencies of an organization. They now have the ability to create new competitive opportunities, which in turn are reshaping the competitive markets. It is the organization's ability to understand and take advantage of how these technologies can affect the competitive market, and their position within it, that is the basis for a digital strategy.

Figure 4.3: Strategy Triangle

Figure 4.3 shows how the corporate, digital and IS strategies relate to each other. At the highest level the corporate strategy will consider the overall vision for the organization and how and when it is expected to realise the vision. It will also identify the core objectives, goals, and deliverables, and how, when, and by whom they will be achieved. The digital strategy will then take the corporate strategy and identify how existing and emerging transformational technologies can be adopted and integrated into core business processes and business models. A key factor of the digital strategy will be the design of products and services and their interoperability with other platforms, and their deployment through digital channels (Rai *et al.,* 2012).

The development of the digital strategy requires input from all functions within the organization. As such, a significant deliverable for the digital strategy is the development of a connected view of how the organization will interact with new technological products, systems and services. The IS strategy then looks to ensure the technology is aligned, integrated, deployed, and adopted as planned. The IS strategy will also consider what technology enabling and enabled resources and capabilities are currently available, and what gaps exist between what can be done now, and what needs to be done to ensure the IS fully supports the achievement of the core business objectives going forward.

4.1.3 Digital Strategy and Value Creation

The purpose of any strategy is to ensure the ongoing viability of an organization. The strategy seeks to identify a path along which the organization will travel, with key objectives and goals identified and communicated to ensure that the collective efforts of all stakeholders are focused on realising the strategy. The digital strategy is no different from any other strategy in this respect. Ensuring the collective efforts of all those involved in the implementation of a digital strategy delivers value to the organization. This in turn is a key imperative for ongoing survival (Pagani, 2013). New technologies are bringing with them many business opportunities such as:

- **Mobile Technologies**: Smart apps development. App marketplaces.
- **Cloud Technologies**: Scalable, low-cost storage. Access to consumer/users' data.
- **Social Internet Technologies**: Access to potential consumers. Targeted marketing. Reduced marketing costs.
- **Big Data Analytics Technologies**: Improved access to consumer behavioural data. Improved predictive analytics.
- **Internet Protocol Technologies**: Improving the way different autonomous technologies can communicate with each other via the internet. These technology advances are driving increased inter-connectivity between a wide range of devices such as cars, phones, domestic appliances, health monitoring, etc. These technologies are more commonly referred to as the internet of things (IoT).

To fully embrace these technologies, organizations need to re-think how their corporate strategy can best utilise them. A key area to focus on is the core value chains being used to support the organization's strategic business models.

Time Out

Think about it: Who's in control?

Monliff Plc is a company that sells pharmaceutical products to a range of dispensing chemists across Europe. The company's most profitable product line centres on a range of own-brand non-steroidal anti-inflammatory drugs in liquid and tablet form. The company has divided its sales region into four main areas; North, Central, East, and Southwest.

Competition is strong in all four regions and Monliff Plc has seen its revenues decrease by on average 5% year-on-year over the last four years. Troy Steel, a veteran of the pharma industry, with over 25 years' sales experience, manages the Monliff sales team across all four regions. The sales team is made up of 20 sales reps who spend most of their time on the road visiting their customers. The company has used the same methods for taking orders for new and existing products for at least fifteen years. The volume of sales is dependent on the sales reps physically visiting the dispensing chemists and discussing new products and re-supply levels for existing stock. Troy knows the sales reps are working hard to get revenue levels up, but they are physically limited by the need to spend so much time travelling between dispensing chemists. One solution would be to increase the number of sales reps, but this will also increase sales costs.

Michelle Okemah is the managing director and is keen to reverse this trend as soon as possible. Five years ago, the company developed a sales management tool for identifying and tracking potential sales leads. The system proved very effective, but the sales reps have been unable to chase up many of the new potential customers because they are spending too much time taking orders for the re-supply of existing products. Michelle feels that technology can help get the company back on track, but is not sure what type of solution is needed. Because of this, Michelle calls into Johan Kepler's office to discuss the issue. Johan is the IT manager and was responsible for designing and implementing the sales lead tracking system.

Johan has been thinking about the problem and believes the IT department can fix it by improving the integration of the internal order management system and the logistics and distribution systems. Michelle agrees that improving the internal order management systems will be welcome;

however, she can't help feeling that this is not where the bottleneck is. In effect, as Michelle sees it, the main issue is how to give the sales teams more time to chase new business opportunities, whilst also giving the dispensing chemists a more seamless way of selecting and ordering products. Is this really an IT issue, or is it a business issue? Michelle is a chemist by training and has never really got too involved in the details of IT design and development, and, therefore, doesn't feel she has the correct level of knowledge to question Johan's suggested solution.

Questions:

- Do you think Johan is looking at the problem from a technical or business perspective?
- Do you think Johan is focusing on the most important issue facing the company at this time?
- Should Michelle let Johan get on and develop his proposed solution and then see how it works (considering it could take 12-18 months before the system is ready)?
- Who else in the organization would you include in the discussion to find a solution to the main issue as Michelle see it?

4.2 Redefining the Role of Technology for the Digital Strategy

As technology becomes more connected, pervasive, and accessible at an individual, societal, and organizational level, the roles that technology plays are changing. In the 1970s and 80s the advent of business computing, through applications such as word processing, spreadsheets, and presentation or graphics programs, gave organizations the ability to process and present data in a much faster, precise, and standardised manner. The technology was a "game changer" for many organizations because it allowed them to improve the efficiency of their business processes such as invoicing, demand and supply planning, stock control, payroll management, and financial management.

However, the technology didn't really change the way that many organizations operated; it just made them faster at executing their business processes. The business models and methods of engagement did not change

in any significant way. That said, with the advent of reliable, scalable networking and internet technologies, technology could now be linked in a way that allowed better ways to access, share, store, and analyse data. This ability to connect critical information systems such as enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM), gave organizations a way of not just manipulating data, but a means of improving the quality of information-based decision-making. Organizations that focused on developing their information systems began to realise the benefits that technology could bring. Technology was no longer being seen simply in terms of just providing a service, in the same way that electricity, heating, and water are necessary services. Connected, integrated and aligned technologies could now be seen to be adding real business value.

With this realisation came an increased demand for technology, which in turn resulted in the commoditisation of computers, and the standardisation of many other technologies such as storage devices, networking, and internet protocols. The advantages that technology could bring were now easily accessible to everyone, irrespective of the industrial sector, geographical location, or cost. Because of this, technology became a necessary cost for any organization looking to engage with and operate in an increasingly connected and techno-centric competitive environment.

Table 4.3 provides an overview of the changing focus on technology or more specifically, how technology can add value to the organization. It is interesting that reasons for the changing focus are mainly due to the impact of the technology itself. In effect, the nature of the technology has fundamentally changed the environment in which it has been deployed. For example, the increase and adoption of mobile technologies (smart phones, tablet computers, etc.) have changed the way in which we, as individuals and organizations, engage with each other. Mobile technologies have facilitated a more mobile and flexible workforce, who, in turn, use their technology to mix both work and personal activities. This has had an impact on businesses, such as banks, which, because of 24-7 access to online secure banking, no longer need the same level of high street presence as they did maybe 5 to 10 years ago. So, in effect, the advent of mobile technologies has reshaped the way we interact with organizations in terms of how products and services are accessed, and how organizations interact with the individual concerning work practices and access to information.

Period	Technology	Impact	Main focus
1960s–70s	Customised mainframe technology, Bespoke software	Improved ability to analyse large data sets.	Improved capacity to handle data.
1970s–80s	Commercially available computers, Business productivity software.	Improved business responsiveness, Improved capacity to process data.	Improved business responsiveness.
1980s–2000s	Low cost computing, Improved networking technologies, Internet connectivity.	Improved data/information sharing, and process efficiency.	Reducing the cost of doing business.
2000s-10s	High-speed broadband, Virtualisation, Shift to internet commerce, Data warehousing, mobile technology.	Allowing businesses to "go global" to sell products and services, without incurring significant scaling costs.	Reducing the cost of doing business. Matching products and services to customer groups.
2010 - Present	Internet hosting, Real-time data analytics, Internet of things, 24-7 access to data.	Improved customer engagement and retention models in hyper-competitive markets. Improved customer insights.	Developing a dynamic view of the competitive environment. Providing a customised/personalised interaction with the customer.

Table 4.3: Changing Focus on Technology

4.2.1 Shifting the Focus from Provision to the Use of Technology

As Table 4.3 shows, much of the focus concerning the application of technology was in reducing the costs associated with running the business. Through the 1980s until the early 2000s the use of IT to a business was seen very much as a cost to the business. Because of this, the provision of IT-based services was negotiated in terms of unit costs, such as megabytes per dollar (MB/$) for storage, megabytes per second (MB/Sec) for upload and download speeds, megabytes per user for email, etc.

IT service providers found themselves in a highly competitive price war over who could provide the most in terms of service for the least cost. Within a relatively static market, where competition stays relatively stable, this "low-cost" model for IT service provision works well. Even if the quality of the agreed service levels is not always consistent, or the type of service is not quite right, the organization can, over a period of time, refine and/or renegotiate the terms of service.

However, since the advent of high-speed, accessible broadband, low-cost storage, and mobile technologies, the number of competitors entering and leaving markets has significantly increased. There is no longer a requirement for a significant financial outlay to set up physical shops or a high street presence. A business can now simply set up online and instantly create a globally accessible product or service offering. Not only has the number of competitors increased, so also has the number of substitutes. In effect, technology has significantly reduced the barriers to market entry as defined by Porter (1985).

This has forced organizations to re-think how they attract and keep their customers. In a market where there is almost certainly someone else selling a similar product or service at a lower cost, organizations need to find better ways of differentiating their offering (Vandermerwe, 2000; Kindström, 2010). Therefore, in a market that is constantly changing, organizations that can flex and respond to changing market forces are better placed to remain competitive. A key factor in remaining competitive is how well the organization understands its customers (Vargo *et al.,* 2004). Because of this need to engage with and understand the customer, organizations need to be quicker at developing new business processes, products and services. The subtle shift from "telling the customers what they want" to "asking the customers what they want" has a significant impact on the organization in terms of its ability to react to market change.

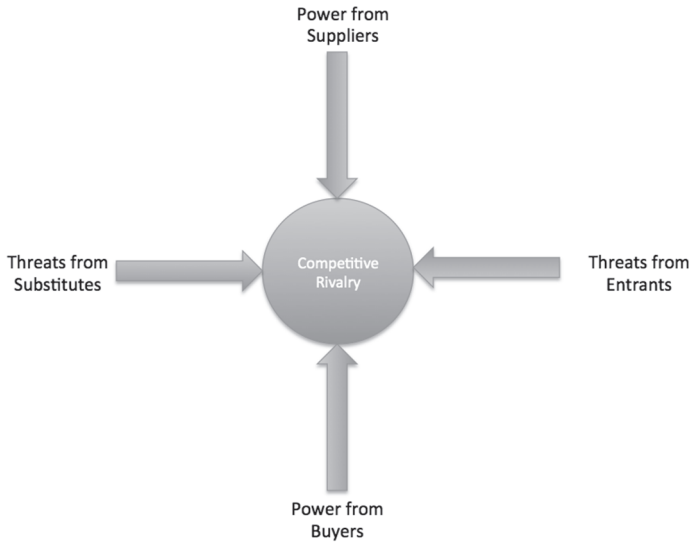

Figure 4.4: Porter's Five Forces Model (Porter, 1985)

Many organizations realise that technology can play an enabling role in developing a more "customer-centric" and responsive organization (Bhatt *et al.,* 2005). The focus on the provision of technology is shifting from cost, which is still important, to how technology can support critical business processes in a way that builds competitive advantage. This shift in perspective is fundamentally at the core of what "digital" is about. Table 4.4 shows how the perspective has changed concerning the value of technology and its role in delivering business value. The examples used are not exhaustive or complete but serve to differentiate the old from the new in terms of strategic focus.

Industry	IT System Focus	Strategic Focus (Old)	Strategic Focus (New)
Manufacturing	ERP, fulfilment, supply and demand planning, stock management	Scalable output, process optimisation, manufacturing quality, reduce manufacturing cost	Faster product development, customer engagement in new product development, ensuring the relevance of products and services.
Banking	CRM, account management, transaction management, wealth management	Reduce cost per transaction, reduce accounting error, financial reporting	Ensuring the relevance of products and services. Understanding customer lending/borrowing requirements. Providing customer defined access to banking systems.
Education	Invoicing, document management, student performance tracking, course scheduling, content management	Student invoicing, exam/assessment /attendance tracking, online content management	Provide customisable and personalised access to courses. Enable global access to course content.
Telecoms	CRM, networking, storage, communications, call handling/routing	Account management, invoicing, communications network availability and management	Provide customisable and personalised communications offerings. Provide a seamless global experience for customers.

Table 4.4: Shifting Strategic Focus

Whilst the business processes being supported by technology remain the same, expectation has changed in terms of delivery. Cost is still an important factor in the selection of any technology, but the organization needs to get more from its technology-based resources and capabilities in terms of

competitive positioning. The new strategic focus places the requirements of the customer at the centre of what the organization is about. As technology is intricately connected to just about all of the core business processes, understanding how technology can be used to build better customer insight and improve customer engagement and retention, becomes vitally important to ensuring the ongoing viability of the organization.

4.2.2 Factors Shaping the Digital Strategy

Sooner or later, every company will have to deal with the impact of digitization on its business model. A digital vision is required to retain customers using both digital and physical products and services, that are delivered through technology enabled supply chains. This vision is also needed to ensure that acquired or created data can yield the relevant information for decision-making and for new forms of cooperation in distributed, intelligent and collaborative networks. While this offers great opportunities, it also presents great challenges. Bharadwaj *et al.* (2013) identify four key themes to guide organizational thinking on digital business strategy and help to provide a framework to define the next generation of insights. The four themes are:

1. **The scope of a digital business strategy:** One of the fundamental questions in strategic management relates to corporate scope, which defines the portfolio of products and businesses as well as activities that is carried out within a company's direct control and ownership. Patterns of corporate scope and the logic of diversification have been shown to impact a firm's performance (Wade & Hulland, 2004), and strategy research has been concerned with how firms optimally use their core competencies and key assets and resources to extend their product and market reach (e.g., Amid & Schoemaker, 1993; Barney, 1991; Conner & Prahalad, 1996; Wernerfelt, 1984, 1995).

2. **The scale of a digital business strategy:** In a digitally intensive world, firms operate in business ecosystems that are intricately intertwined. As such, a digital business strategy cannot be conceived independently of the business ecosystem, alliances, partnerships, and competitors. Furthermore, the use of digital platforms enables firms to break traditional industrial boundaries and operate in new spaces and niches that were earlier only defined through those digital resources (e.g.,

D'Adherio, 2001; Klein and Rai, 2009; Rai *et al.,* 2012; Saraf *et al*., 2007). Take, for example, how Apple has redefined the mobile entertainment ecosystem, or how Amazon has redefined the book-selling ecosystem. In these two cases, there is no meaningful distinction between business strategy and IS strategy, another example of digital business strategy.

3. **The speed of a digital business strategy:** There is general consensus that technology has allowed firms to speed up decisions that otherwise might be slowed due to information flows up and down the hierarchy through multiple layers of management. Market-leading companies such as P&G, GE, and Cisco have invested significantly to provide management with the capability to access diverse streams of information from within the firm and extend it to key partners and allies. Speed as a dimension becomes important in the context of responding to customer service requests in real time through Twitter, Facebook and other social media platforms. Slowness in response could mean customers moving away from companies perceived as being out of tune with the new reality. Thus, companies across a variety of industries are experimenting with multifunctional, integrative command centres (e.g., Pepsi's Mission Control for Gatorade and Dell's Social Media Centre) to organise information flows from within the company and outside to increase the organizational ability to sense and respond faster than ever before.

4. **The sources of business value creation and capture in a digital business strategy:** While information-based businesses have existed for a long time (e.g., newspapers and magazines) in physical forms, the digital business context brings new opportunities to create value from information. As magazines abandon their physical formats (e.g., Newsweek), they need to fundamentally re-think their unique source of value through curating content and assess the balance between subscription and advertising. Google, Facebook, and eBay are just a few examples of new value created from information that go beyond niche areas such as financial services whose business models rely on accurate, timely information. Moreover, many firms are able to fine-tune their actions and personalise their offerings based on information about customer preferences through Facebook, Twitter, and others. In addition, many business models based on information have emerged in areas such as healthcare and energy. The digital business strategy has also made possible the democratization of content as well as the

subsequent sharing, remixing, redistribution, and re-syndication of content in newer and more useful forms. These transformations have caused dramatic power shifts in market channels and dis-intermediations that disrupt traditional sources of economic profits while creating fundamentally new sources of value.

Bharadwaj *et al.* (2013) see each of these themes as being shaped by a number of key external trends and organizational shifts.

Key External Digital Trends	Key Organizational Trends
Pervasive connectivity	Limitation of traditional business models
Information abundance	Cross-functional role of IT
Global supply chains	New mandate for IT and the CIO
Improved price/performance of IT	Increased familiarity with IT
Growth in cloud computing	
Emergence of big data	

Table 4.5: Key External and Organizational Trends

The combination of these key trends is driving organizations to review how they engage with technology in a more effective manner. **Digital business strategy** is different from traditional IS strategy in the sense that it is much more than a cross-functional strategy, and it transcends traditional functional areas (such as marketing, procurement, logistics, operations, or others) and various IT-enabled business processes (such as order management, customer service, and others). Therefore, digital business strategy can be viewed as being inherently cross-functional. All of the functional and process strategies are encompassed under the umbrella of digital business strategy with digital resources serving as the connective tissue. Digital business strategy relies on rich information exchanges through digital platforms inside and outside organizations that allow multifunctional strategies and processes to be tightly interconnected with the aid of inter-firm IT capabilities (e.g., Rai *et al.,* 2012). Discussions concerning how technology shapes and influences business strategy, originally articulated by Henderson and Venkatraman (1993), now emerge as a central theme underpinning the concept of a digital business strategy.

Accordingly, digital business strategy is broader, more prominent, more embedded, and more encompassing than other functional strategies. Consequently, while IS strategy may be positioned as a functional-level strategy (under the province of the chief information officer), digital business strategy should not be positioned below business strategy but treated as the business strategy itself for the digital era. Over time, as firms and industries become more digitally focused and reliant on information, communication, and connectivity, Rai *et al.* (2012) envision that digital business strategy will become *the* business strategy. At that juncture, there would be no separation between business strategy and digital business strategy.

Time Out

Think about it: Digital Government Departments

Jack Reach is the Chief Information Officer for the Government's Department of Revenue. The department is responsible for ensuring that all forms of tax are collected from a national population of nearly 15 million people. As the Government's only agency responsible for collecting all forms of tax, the Head of the Revenue Services doesn't need to worry about other forms of competition. However, Selma Orr, the Government's Chief Information Officer has been recently appointed to see how a "digital strategy" would improve the efficiency of all Government departments, including the Department of Revenue (DoR).

Jack's immediate boss is Simon Wayne, who is the Head of Revenue Services, and the senior civil servant responsible for the running of the department. Simon has been in the post for seven years, and is sceptical about what he sees as just another trend, that the term "digital" will be replaced by another term in a few months, and therefore, it's nothing to get too worked up about. Besides, the Department of Revenue is not focused on building competitive advantage, or even profit, so why change what is already working…right?

In terms of the day-to-day operations, the DoR is seen as a well-functioning service by the rest of the civil service, and Simon Wayne does not want to jeopardise this view by embarking on a digital transformation that seems

vague in terms of its outcomes, and more suited to commercial enterprises operating in highly competitive environments.

Selma Orr is the government's appointed Champion for the Digital Enablement Programme. However, Selma has no authority to direct the different Heads of Department to develop a digital strategy – Selma's only option is to try and influence the Heads of Department to engage in the Digital Enablement Programme of their own volition. Jack has met with Selma and sees merit in developing a digital strategy for the DoR. Jack also knows that Simon is a reasonable person and will respond favourably to a well-structured and compelling argument for digital. However, it's up to Jack (and Selma to a lesser extent) to build a compelling case, and to present it to Simon and the rest of the management team.

Questions:

- Do you think Simon Wayne is right to resist the request to develop a digital strategy as part of the Digital Enablement Programme?
- What aspects of a digital strategy should Jack focus on to make a more compelling case?
- Although Jack is the CIO for the DoR, and sees the merit in developing a digital strategy, should he be the one to develop the strategy? Who else would you suggest should be involved?
- What benefits do you think a digital strategy could bring to the DoR? Maybe think in terms of the questions outlined in Table 4.1 Technology Enablement and Considerations

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4.3 Building the Digital Strategy

The digital strategy is designed to take the overall corporate strategic vision and objectives and realise them through the use of digital enabling technologies. Whilst the digital strategy is concerned with how technology can achieve the strategic objectives of the organization, the focus is firmly on the business value that the technologies can deliver, not just the speed

and cost of implementation. Examples of the types of business value that organizations might look to realise are:

- **Improved Product Development Process**: Ensure products and services are better matched to the customer's requirements.
- **Improved Product Time to Market**: Reduce the time taken to move a product or service from the concept stage through to final production.
- **Development of New Digital Business Models**: Better utilise technology to create new digital channels to reach customers.
- **Improved Customer Retention**: Use improved analytics to better understand the customer's engagement and buying preferences, and customise or personalise the product or service accordingly.
- **Improved Speed of Entry**: Use digital technologies to enable faster product launches into new markets, without incurring high start-up costs.
- **Reduced Process Costs**: Improved data analytics to optimise process performance.

These are only a few examples of how organizations are using digital technologies to deliver improved business value. In essence, the process for developing a digital strategy is no different from the process for developing any other aspect of organizational strategy. However, there is one fundamental difference in that the digital strategy, more than any other strategy, directly impacts all parts of the organization. This is largely due to the increasing dependence of core business processes on technology.

There are various different approaches to developing digital strategies. Most organizations will have their own customised approach, which will have been refined through experience to suit their own particular way of doing things. However, all will share four fundamental stages in how they develop their digital strategies. These four stages are as follows:

- **Matching Business Requirements to Digital Capability**: Understand what the business is trying to achieve in terms of its strategic vision and objectives, and assess how digital technologies can be used to support their achievement in a connected manner.
- **Matching Customer Requirements to Business Requirements**: It is vital for customer acquisition and retention to understand how the customer and end user want to engage with the business in order to consume products and services, and how the business

wishes to engage with its customers. Even if customers want the products and services, they may be deterred from consuming them if the routes for engagement and access are not convenient, reliable, or available.

- **Develop a Vision of how the Digital Capability will support Business and Customer Requirements**: Understand how digital technologies can be used to connect the overall business strategy vision in a way that builds a strong connection between the customer and the brand.
- **Prioritise a set of Digital Initiatives to Deliver the Vision**: When it is understood how the digital technologies should support the business, they can be prioritised in terms of their implementation. No organization will have the resources to implement a digital strategy instantaneously. Therefore, the order in which the digital technologies should be deployed must be prioritised in a way that best supports the overall business strategic plan.

From the four stages it is clear that the main distinction between the digital strategy and any other functional strategy is its cross-functional aspect. The digital strategy needs to consider how each one of the other parts of the organization (HR, finance, sales, manufacturing, marketing, fulfilment, logistics, etc.) needs to engage with their internal and external stakeholders in order to improve its own performance. The digital strategy will strive to ensure that the core cross-functional business processes operate effectively in meeting the overall key business objectives.

Another interesting aspect of the digital strategy is the importance placed on understanding the requirements of the customer. This level of understanding can be expanded to include all external stakeholders such as suppliers, business partners, the media, lobbyists, etc.; in effect, any stakeholder group looking for access to not only products and services but also information. A failure to understand who the external stakeholders are, may result in the wrong message or signals being communicated. In a fast-moving and dynamic competitive environment all digital channels into and out of the organization need to be viewed as information channels. Across these channels the information must be coordinated and managed to avoid stakeholder confusion through conflicting, erroneous, or missing information.

4.3.1 Identifying and Managing Stakeholder Expectations

Irrespective of the type of change being planned there will be stakeholders in the form of individuals and groups with varying degrees of interest in the outcome. The implementation of a strategic plan is no different in this respect. These individuals and groups can exert significant influence, and they can reside within the organization at any level as workers, management, board members, union representatives, etc., or they can be external to the organization as customers, suppliers, legislators, journalists, investors, competitors, etc. What they will all have in common is their interest in the outcome of any change initiative, and how the change is managed.

However, the reaction and level of interest that each stakeholder or stakeholder group exhibits will vary depending on the type of change being considered. For example, relocating a manufacturing site to a lower cost site in another country may elicit a negative response from the existing internal work force, a positive response from shareholders, and a neutral response from customers. But if the decision is to discontinue a popular product line in favour of a replacement product the responses might be quite different; customers exhibit a level of dissatisfaction, with the workforce remaining neutral, and the shareholders being cautiously positive.

In effect, the nature of change means that the environment is constantly being disrupted and changed. Because of this dynamic situation, stakeholder expectations will also be changing, and, therefore, will need to be managed accordingly. Because of a difference in expectation across the stakeholder groups it is normal for conflict to exist regarding the perceived importance of many aspects of the strategic plan. According to Johnson *et al.* (2009), there are some common conflicts in terms of stakeholder expectations. These are as follows:

Common Stakeholder Conflicts of Expectation
• In order to grow, short-term profitability, cash flow and pay levels may need to be sacrificed.
• Short-termism may suit managerial career aspirations but preclude investment in long-term projects.
• When family businesses grow, the owners may lose control if they need to appoint professional managers.

• New developments may require additional funding through share issue or loans. In either case, financial independence may be sacrificed.
• Public ownership of shares will require more openness and accountability from the management.
• Cost efficiency through capital investment can mean job losses.
• Extending into mass markets may require a decline in quality standards.
• In public services, a common conflict is between mass provision and specialist services (e.g. preventative dentistry or heart transplants).
• In large multinational organizations, conflict can result because of a division's responsibilities to the company and also to its host country.

Table 4.6: Stakeholder Conflicts of Expectation (Johnson *et al.,* 2009)

Because of the potential conflict that such differences in expectation can create, the implementation of a successful strategy must seriously consider how to manage stakeholder concerns and expectations. A very useful tool in gaining insight into the levels of interest and influence that stakeholders might have in a planned change event is the **Power/Interest Matrix** (Mendelow, 1991). This matrix maps stakeholders against two variables: their level of interest in the specific change being considered, and their ability or power to influence the outcome of this change. Figure 4.5 shows a visual representation of the power/interest matrix.

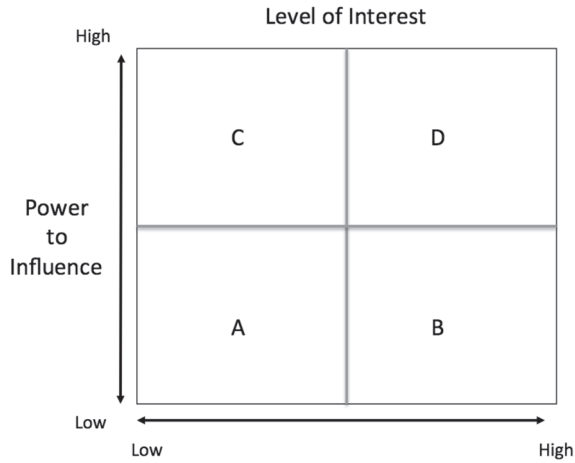

Figure 4.5: Power/Interest Matrix (Mendelow, 1991)

The matrix is divided into four boxes titled A, B, C and D. Each of these boxes represents a combined level of power and interest against which different stakeholder groups can be identified. By placing the identified stakeholders in the different boxes, the organization can better gauge the most appropriate response in managing the different groups. If we look at the matrix the responses can be broadly identified as follows:

- **A: Low Power and Low Interest**: These stakeholders will require minimal effort in managing their levels of expectation.
- **B: Low Power and High Interest**: Although these stakeholders may have a low level of direct influence, they may be able to indirectly influence other more influential stakeholder. Therefore, this group will need to be kept informed of the progress of change.
- **C: High Power and Low Interest**: This group has the potential to significantly influence the outcome of the change, however, members of the group are not currently showing much interest. This group therefore, needs to be kept satisfied in terms of managing their expectations for the overall outcome of the change initiative.
- **D: High Power and High Interest**: This group is closely following progress and has the power to influence the outcome if not satisfied with the progress or direction of change. The close management of this key group is critical if the change is to be a success.

So, although the different groups require different levels of intervention and management the stakeholders may move between the different boxes depending on the progress of the change. For example, if a strategic change is causing a fall-off in performance and service quality, customers who might previously have been in group C might start moving into group D. Or if the streamlining of certain business processes is starting to cause employee unrest, journalists and bloggers in A might move into group B where they start to adversely influence the level of goodwill that the organization might previously have had with its customer base.

Johnson *et al.* (2009) have identified some ways in which this form of stakeholder mapping can be used to better understand some common issues.

- In determining purpose and strategy, which stakeholder expectations need to be most considered?
- Do the actual levels of interest and power of stakeholders properly reflect the corporate governance framework of the organization (more on corporate governance in Chapter 6: IT Governance and Risk Management)?
- Who are the key blockers and facilitators of a strategy, and how can they be better managed?
- Can certain stakeholders be repositioned to better influence the outcome of the desired change? This might be to lessen the impact of certain key stakeholders, or support a partisan position for change amongst certain stakeholders.

The thing to remember is that the stakeholder map is dynamic. As change rolls out across an organization it will continue to influence the expectations of all those it touches. Because of the impact that the progress of change has on expectations, stakeholders can and will move between the groups. The challenge for those managing the strategic change is to understand who the stakeholders are and to keep managing their expectations based on their current position on the map.

4.3.2 Considerations in Constructing the Digital Strategy

According to Chaffey (2010), reviewing an organization's capacity for developing a digital strategy is similar in terms of the process to traditional strategy development, but it is focused on managing the specific issues of digital strategies. Therefore, an effective digital strategy should:

- Provide a future direction for internet marketing activities – therefore, a long-term road map of web services and functionality is needed.
- Develop a business analysis of the organization's external environment (specifically, a review of the online marketplace focusing on customer characteristics, preferences, and needs against competitor and intermediary offerings) and the internal resources and capabilities to implement the strategy.
- Articulate goals for digital channels that support marketing objectives.
- Involve a selection of strategic options to achieve goals for digital channels and create sustainable differential competitive advantage.
- Include strategy formulation to include typical marketing strategy options such as target markets, positioning, and specification of the marketing mix.
- Define which strategies NOT to pursue and which functionality is not suitable for implementation.
- Specify how resources will be deployed and how the organization will be structured to achieve the strategy.

These considerations represent a broad range of actions to be built into the development of the digital strategy. Due to the manner in which technology is being used to support core cross-functional business processes, changes to the underlying systems need to be understood in terms of the wider end-to-end impact on the performance of key business processes. This raises a particular problem for organizations: how do they build flexibility and responsiveness into systems without making them overly complex, and therefore, difficult to manage? There is no easy answer to this question. However, the formation of a coherent aligned digital strategy linking the corporate strategic vision and the information systems strategy will help to manage a smoother, and more responsive strategy implementation. To ensure that the digital and information systems strategies are in alignment with the overall corporate strategy, Ross & Weill (2002) contend that certain key decisions concerning the technology should not be left to the IT/IS

function alone (see Chapter 2: IS and Business Strategy Alignment). In order to ensure continued alignment and business engagement in the digital/IS strategic planning process a technology road map should be developed to show how technology will be used to enable the achievement of the key business strategy objectives. Boddy *et al.* (2009) identify the following components of such a road map:

- **Direction of Systems Development**: Identify which technologies are to be phased out, and when this is due to happen. Also identify which technologies are being phased in and the timeframe for implementation. For example, shifting from using internally managed servers to outsourced cloud servers, or the timeline for implementing an SAP-based manufacturing system.
- **Rationale**: Each decision for replacing, renewing, or even retaining certain technologies should be supported by a business case rationale so the reasons for any changes are clearly understood in terms of business impact.
- **Current Situation**: Determine the current situation in terms of technology deployment, performance, and alignment to business strategy. Any misalignments due to either an emergent business strategy or a failure to align with existing strategic intent need to be highlighted. These alignment issues can be used to set the prioritisation of project activity on the implementation plan.
- **Management Strategy**: Define what will be the management strategy for ensuring the successful implementation of the digital/IS strategy. This should include reporting structures, performance metrics, milestone management, the project management process, and stakeholder management.
- **New Technology Developments**: Consider what new technology will be part of the strategic plan, how it will be evaluated to ensure it is "fit for purpose", and what timelines are being considered for implementing such technologies across the organization.
- **Implementation Plan**: Consider how the technology will be deployed to support the overall strategic vision and objectives, what the timeline will be and how this aligns with the overall strategic implementation timeline.
- **Budget**: Consider the cost for implementing the digital/IS strategy and the plans that have been put in place for managing the cost over/under spend.

Digital and information systems share a couple of key considerations in their strategic planning: they are both integral to the modern organization's overall strategic plan, and the main guiding input must come from the business side of the organization. As information systems (IS) are now an integral aspect of most core business models senior managers from both the business and technical parts of the organization must consider the following (Oz, 2006):

- IS should be recognised as an indispensable resource.
- IS should be understood as a complex resource that must be planned and controlled.
- IS should be regarded as an essential resource for the whole company.
- IS should be regarded as a source for strategic advantage and for the control of processes.

Although these considerations focus on IS, the importance of perceiving IS in this way is fundamental to the development of an aligned digital and IS strategy.

4.3.3 Digital-enabled Strategic Options

There are different strategic options that organizations can opt for in order to achieve their desired position within their respective markets. The two most commonly pursued strategic options are:

- **Cost Leadership Strategy**: Based on the ability to compete on low cost.
- **Differentiated Strategy**: Based on the ability to compete on high performance.

Porter (1998) argues that in order to develop a unique and defendable competitive position an organization should seek either a low-cost leadership or a differentiating strategy. However, according to Hungenberg (2006) there is a third option:

- **Outpacing Strategy**: Based on combining the advantages of a cost leadership and differentiating strategy.

The outpacing strategy has been enabled through the advantages and benefits that technology can provide in terms of process improvement at a reduced cost to the organization. The once prevailing assumption was that the selection of either a low-cost or differentiating strategy would require some trade-offs. For example, a differentiating strategy based on quality could not be delivered at a competitive low cost. Conversely, producing a product or service at a low cost would have a limiting impact on quality. Traditionally, organizations that tried to be both low cost and a differentiator tended to find themselves underperforming against both strategies.

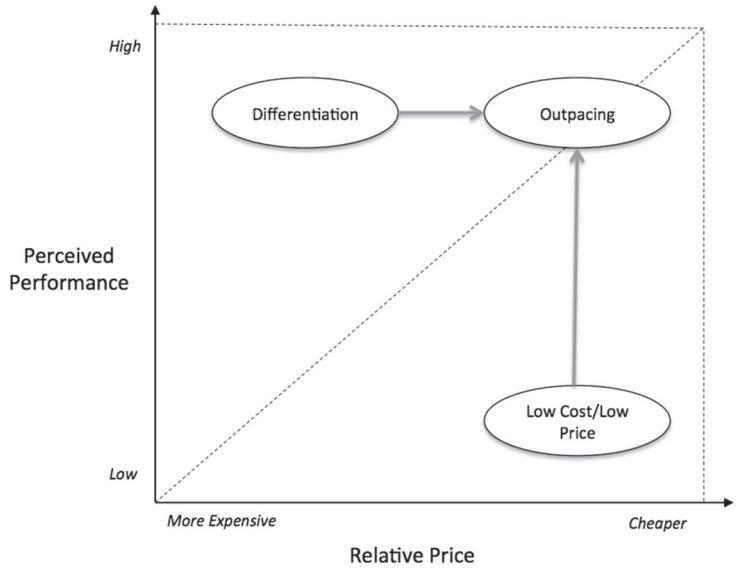

Figure 4.6: Outpacing Strategy (Hungenberg, 2006)

Hungenberg (2006) has identified three key areas that can enable an organization to adopt an outpacing strategy. These are:

- **Access to New Technologies**: The advent of the internet and high-speed broadband has allowed organizations such as Amazon to deliver a quality product at a lower cost compared to their high-street-based competitors. The ability to move a business to an online model will see significant cost savings if that business no longer requires a high-street

presence. In the case of Amazon during the period 1999 to 2003 the business experienced a 300% increase in volume handling within its warehouses, and a reduction in warehouse operational costs from 20% down to 10% (Jelassi & Enders, 2009). Businesses that experience similar savings can pass them on to their customers without negatively impacting the overall quality of their products or services.

- **Removal of Wasteful Activities**: Through improved process control and design, organizations can identify wasteful, repetitive, or redundant practices. When organizations are able to fine-tune and optimise their core business processes, they are able to realise significant cost savings across their supply chains. However, removing cost out of core processes may reduce their ability to flex and respond quickly to market changes.

- **Scale Economies and Learning Effects**: Over time organizations will learn how to do things better through experiential learning. These learning points can be used to redefine business processes and business models. This can be supported by the savings achieved through scale effects. For example, the Tesco retail organization can offer its products and services at low cost, via its online and offline channels, due to its size and dominant market position. Tesco exerts a strong level of control over its suppliers and due to the volume of sales it is able to source products and services at a lower cost than its competitors.

Across all three of these areas, technology can be seen to provide organizations with the ability to develop their preferred strategy. Table 4.7 shows how some technologies have had an influencing effect on all three of these strategic options.

Strategy Type	Enabling Technology	Business Focus	Example
Low Cost/Low Price	Internet, e-commerce, ERP systems	Improved efficiency of core processes	Dell, EasyJet
Differentiator	Mobile technologies, CRM systems	Improved customer experience	Apple, Virgin Airways
Outpacing	Internet, High-speed broadband	Improved customer insight	Amazon, iTunes, Netflix

Table 4.7: Technology Influence on Strategic Options

Organizations will struggle to strike a balance between low-cost leadership and differentiating strategies. This is only to be expected, as no organization can be good at everything, all of the time. However, organizations that can use technology to take costs out of their business, and develop new ways of getting their products and services in front of their customers via digital channels can "outpace" their competition. How long they can maintain any gained competitive advantage will depend on how quickly the competition can catch up with them.

Time Out

Think about it: Assessing the Impact of a Digital Strategy

SpamCo Ltd. is a manufacturer and provider of high-quality kitchen utensils and cooking equipment. The product portfolio is spread across commercial and professional users, and domestic users. SpamCo Ltd. has been selling its products via a well-established partner channel with many of the best-known high-street retail outlets promoting their products. There are a lot of competitors in the same market but SpamCo Ltd., has built a strong customer base through the consistent provision of quality products.

Ten years ago, SpamCo Ltd. outsourced its manufacturing to partners in Asia-Pacific, Eastern Europe, and North America. Initially there were some

quality issues, but SpamCo Ltd. introduced a profit-sharing agreement with the manufacturing partners, which saw a return to the expected quality levels.

Alex Wei is the Sales Director and has built up a large sales team whose reps spend most of their time on the road visiting the channel partners. The sales team is the largest department in the organization with over 60 sales reps spread across Europe. Alex Wei has spent a long time building the sales team and is quite proud of his achievement, and the status it gives him to be in charge of the largest department.

Over the last 18 months, competition has become more intense, and a recent downturn in the global economy has also seen a decrease in customers buying new products. Dani Asnovoir is the Managing Director and is keen to see an increase in revenue and profitability as soon as possible. Raising prices is not an option at the moment due to the increased number of competitors, and because customers are not prepared to pay for a quality product.

At the weekly senior management meeting the falling sales figures are reviewed once again. Everyone is subdued and both Alex and Dani are unable to think of a way to reverse the downturn. Tony Becker, the IT Manager, speaks up and suggests that maybe technology could help get the company back on track. The management team is sceptical. They have a state-of-the-art order management system and distribution system… so how else can technology help? Tony suggests the development of a digital strategy to identify new ways of interacting with customers, and possibly even taking more cost out of the core supply chain processes. Tony goes on to say that the strategy may require a significant re-alignment of core resources, and some organizational restructuring… Dani Asnovoir is interested to hear more, but Alex Wei is beginning to look pale, and a little concerned.

Questions:

- What type of strategic option is SpamCo Ltd. currently pursuing? And what option is available to the company?
- Who are the key stakeholders that are likely to be impacted through the implementation of a digital strategy?

- Why do you think Alex Wei was not comfortable with the conversation about a digital strategy?
- What types of business value can you see being generated through the adoption of a digital strategy?

4.4 Learning Summary

An understanding of the concept of a digital strategy requires an understanding of the relationship between the IS strategy, the corporate strategy, and other functional strategies across the organization. Because technology has become more integrated into business processes, and organizations are becoming more dependent on technology to reach, communication with, and service customers on a global level, technology can no longer be simply seen as a utility such as plumbing or electricity. Technology is no longer simply supporting business processes but enabling them.

However, before rushing off to develop a digital strategy, organizations must first ensure they have a corporate strategy that is appropriate to the market, realistic in terms of expectations, and well communicated in terms of what's expected when it comes to achieving core business objectives. The responsibility is still firmly with the senior management team to make the right strategic decisions concerning the market segments to be pursued, the product mixes to be developed, and how the organization needs to be structured and aligned to support any new business models. It is important to note that technology will not turn a badly thought out strategy into a good, effective strategy, but if technology is not considered as part of the overall strategic plan then the organization's ability to react to customer needs and changing market forces will be seriously impacted. Therefore, for the corporate strategy to be effective it must consider how technology can help the organization to respond to changing customer needs in an increasingly dynamic and volatile market.

Each organization will need to review how technology best fits with its own unique strategic objectives. In effect, the conversation relating to how technology supports the business is no longer simply a conversation for the IT function. Across many firms spanning different industries and sectors,

digital technologies (viewed as combinations of information, computing, communication, and connectivity technologies) are fundamentally transforming business strategies, business processes, firm capabilities, products and services, and key inter-firm relationships in extended business networks. Accordingly, some argue that the time is right to re-think the role of IT/IS strategy, from that of a functional-level strategy, aligned but essentially always subordinate to business strategy, to one that reflects a fusion between IS strategy and business strategy. It is this fusion that defines the concept of a digital business strategy. What the digital strategy does is introduce the need for all functional strategic plans to consider how digital technologies can be used to implement and support their respective strategic objectives.

The development of the digital strategy requires input from all functions within the organization. As such, a significant deliverable for the digital strategy is the development of a connected view of how the organization will interact with new technology products, systems and services. The IS strategy then looks to ensure that the technology is aligned, integrated, deployed, and adopted as planned.

Because of the commoditisation, and accessibility of technology, how technology can add value to the organization has changed over the last few years. What is interesting is that the reasons for the changing focus are mainly due to the impact of the technology itself. In effect, the nature of the technology has fundamentally changed the environment in which it has been deployed. Many people now use their work and personal computers, tablets, phones, etc., for both work and home use. This pattern of use has effectively reshaped the way we interact with organizations and each other on a social and commercial level. This change in the way that employees and consumers interact with organizations has forced organizations to re-think how they attract and keep their customers. In a market where there is almost certainly someone else selling a similar product or service at a lower cost, organizations need to find better ways of differentiating their offering. Therefore, in a market that is constantly changing, organizations that can flex and respond to the changing market forces are better placed to remain competitive. Many organizations realise that technology can play an enabling role in developing a more “customer-centric” responsive organization. The focus on the provision of technology is shifting away from cost, which is still important, to how technology can support critical business processes in a way that builds competitive advantage. This shift in perspective is at the core of what “digital” is about.

Digital business strategy is different from traditional IS strategy in the sense that it is much more than a cross-functional strategy, and it transcends traditional functional areas (such as marketing, procurement, logistics, operations, or others) and various IT-enabled business processes. Hence, digital business strategy is broader, more prominent, more embedded, and more encompassing than other functional strategies. Consequently, while IS strategy may be positioned as a functional-level strategy (under the province of the chief information officer), digital business strategy should not be positioned below business strategy but treated as the business strategy itself for the digital era. Over time, as firms and industries become more digitally focused and reliant on information, communication, and connectivity, it is envisioned that digital business strategy will become *the* business strategy. At that juncture, there would be no separation between business strategy and digital business strategy.

Whilst the digital strategy is concerned with how technology can achieve the strategic objectives of the organization, the focus is firmly on the business value that the technologies can deliver; not just speed and cost of implementation. Some of the areas in which a well-implemented digital strategy can deliver improved business value are as follows:

- Improved product development process.
- Improved product time to market.
- Development of new business models.
- Improved customer retention.
- Improved speed of entry.
- Reduced process costs.

A significant aspect of any digital strategy is the importance placed on understanding not just the requirements of the end customer, but also those of all the key stakeholders. Therefore, effective communication is vital, and hence, in a fast-moving and dynamic competitive environment all digital channels into and out of the organization need to be viewed as information channels. Across these channels the information must be coordinated and managed to avoid stakeholder confusion through conflicting, erroneous, or misleading information.

The development of a digital strategy is similar in terms of the process to traditional strategy development, but it is focused on managing the specific issues of digital strategies, such as the business value that current and future technology solutions can bring to the organization. One such aspect of

business value is the potential that a digital strategy can have in facilitating a third strategic option other than a **Cost Leadership** or **Differentiated Strategy**. This third option is an **Outpacing Strategy**. The outpacing strategy has been enabled through the advantages and benefits that technology can provide in terms of process improvement at a reduced cost to the organization. Three key aspects of a digital strategy can help facilitate the adoption of an outpacing strategy for the organization. These are:

- Access to new technology.
- Removal of wasteful activities.
- Scale economies and learning effects.

Organizations that can use technology to take costs out of their business, and develop new ways of getting their products and services in front of their customers via digital channels, can "outpace" their competition. How long they can maintain any gained competitive advantage will, however, depend on how quickly the competition can copy them.

4.5 Case Study: Netflix

Netflix is a US based company that delivers on-demand digitally streamed media to viewers in over 40 countries across North and South America, Europe, and Asia. The company was set up in 1997 and as of 2019, reported a revenue of US$20.2 billion, with nearly 170 million customers worldwide. Although the company was founded in 1997 it wasn't until 2000 that the company started to ship its first DVDs to customers in the US.

Prior to the launch of Netflix, the main way for customers to get access to films on DVD was via high-street outlets such as Blockbuster, and other sales and rental outlets. Although membership was usually required to rent DVDs, customers would also pay a rental fee for each DVD they rented per night. The Netflix model was different. Netflix launched a subscription service where members could rent movies from an online catalogue and the films would be posted directly to them. Once the member was finished with the DVD, they simply returned the film in a pre-paid envelope and selected another film. The cost of renting and post and packaging was included in the monthly subscription.

Although the Netflix model was experiencing rapid revenue growth, and taking a significant market share from the existing high-street competitors, it was not without its problems: late fees, lack of availability of newly released films, and delays in delivery were impacting revenue collection and customer satisfaction. In 2007 Netflix started to move away from physically shipping DVDs to members, and established its video on-demand subscriber service via the internet. With increased broadband speeds, and the growth in wi-fi services, by 2010 Netflix had shifted from being the fastest growing customer of the US Postal Service to the biggest off-peak source of internet traffic in the US.

With a streaming service Netflix could instantaneously deliver films, TV programmes, documentaries, etc., to customers. This service also saw the problem of collecting late fees, or not having enough copies of the latest films, etc., to meet demand, become a thing of the past. The streaming service has become very popular due to the ability to access the Netflix film/programme catalogue from any internet ready device (PC, tablet, phone, gaming console, etc.). This makes connecting to Netflix very easy with no requirement for access to any specific technology other than the internet.

Part of the appeal of the service is the ability to match recommended films to the subscriber's preferred genres. This is designed to take the tedium out of having to scroll through the catalogue for the viewer, with Netflix providing recommendations based on the subscriber's viewing history. This ability to provide subscriber recommendations is due to a sorting algorithm developed by Cinematch in 2007. The algorithm allows subscribers to tap into a wider database of films, many of which the subscriber may not have been aware existed in the Netflix catalogue.

As of 2011 Netflix is also providing original programming, not only providing access to a growing catalogue of films and TV programmes, but now also providing access to original content produced specifically for Netflix. This includes programmes such as House of Cards, Orange is the New Black, Daredevil, Sense8, etc.

However, the success that Netflix is experiencing has not gone unnoticed. Amazon has launched its own subscriber service called Amazon Prime.

Other providers are also developing on-demand streamed services such as Apple TV, Redbox, Disney, and Sky On-demand.

Although Netflix is not yet available in every region (Russia, China, Africa, the Middle East, and India) there are plans to grow the number of international subscribers over the next five years.

Questions

1. How does Netflix compare to Blockbuster when you consider the questions of technology enablement? (Table 4.1)?

2. How is Netflix engaging with technology to develop business value?

3. How do you think the strategic focus of Netflix has changed from its initial posted DVDs to the current on-demand streaming service?

4. How can Netflix develop and maintain a competitive advantage?

4.6 Review Questions

True/False Questions

4.1 A digital strategy is mainly concerned with the application of internet technologies. T or F?

4.2 A digital strategy is just a modern term for IT Strategy. T or F?

4.3 A digital strategy should consider the implications of technology on the core business/organizational objectives. T or F?

4.4 Developing a digital strategy is the sole responsibility of the CIO. T or F?

4.5 An effective corporate strategy for any organization looking to bring timely and relevant products and services to customers, wherever they are, is fundamentally a digital strategy. T or F?

4.6 The digital strategy replaces the need for a marketing strategy. T or F?

4.7 A good digital strategy will make a bad corporate strategy better. T or F?

4.8 A digital strategy must consider how technology can improve the way organizations communicate with their customers. T or F?

4.9 A digital strategy must consider how to deliver products and services in an innovative way to customers. T or F?

4.10 Understanding how technology supports the business is a key issue for the IT function to resolve. T or F?

4.11 A key challenge for all senior managers is how technology can improve overall performance and build competitive advantage. T or F?

4.12 The development of a digital strategy replaces the need for an IS strategy. T or F?

4.13 A key aspect of any digital strategy is the development of a connected view of how current and new technologies will support the development of new and existing products and services. T or F?

4.14 The development of a digital strategy is fundamentally no different to the development of any other functional strategy. T or F?

4.15 A digital strategy will help develop more flexible and responsive business models. T or F?

4.16 A digital strategy is designed to create a more "product-centric" organization. T or F?

4.17 Digital strategy is mainly focused on helping organizations reduce cost through process automation. T or F?

4.18 Not for profit, or Government sector organization does not need to consider developing a digital strategy. T or F?

4.19 The ability to reach out to customers through social media is changing the way new products and services are being developed. T or F?
4.20 Digital strategy differs from IS strategy in that it is more cross-functional in its level of impact. T or F?

4.21 A digital business strategy is broader, more prominent, more embedded, and more encompassing than other functional strategies. T or F?

4.22 A digital business strategy should not be positioned below business strategy but be treated as the business strategy itself for the digital era. T or F?

4.23 The primary focus of a digital strategy is firmly on improving access speed and cost of implementation. T or F?

4.24 In a fast-moving and dynamic competitive environment all digital channels into and out of the organization need to be viewed as information channels. T or F?

4.25 Stakeholder levels of expectation will remain constant throughout any change initiative. T or F?

4.26 A useful tool for mapping stakeholder interest in potential change is the information/interest matrix. T or F?

4.27 Stakeholder mapping can be used to identify the key blockers and facilitators for change. T or F?

4.28 A digital strategy can provide an organization with a new strategy option called an “outsourcing strategy”. T or F?

4.29 A digital strategy can help organizations strike a balance between “low-cost leadership” and a “differentiator” strategy. T or F?

4.30 A digital strategy will ensure a sustained competitive advantage. T or F?

Multiple Choice Questions

4.31 Which of the following is not a key consideration for any corporate strategy?

A. Employee connection to information systems
B. Better understanding of opportunities and threats
C. Reduced cost of technology
D. Improved supply chain performance

4.32 Which of the following technologies is not considered a major business opportunity driver?

A. Mobile technologies
B. Data analytics technologies
C. Social internet technologies
D. Physical storage technologies

4.33 Which of the following is not a main consideration for the development of a digital strategy?

A. Improved customer retention
B. Cost savings
C. Product and service innovation
D. Business model flexibility

4.34 Which of the following is not a key theme in shaping the development of a digital strategy?

A. The scale of digital business
B. The scope of digital business

C. The speed of digital business
D. The cost of digital business

4.35 Which of the following organizational shifts does not have a key impact on the strategic themes?

A. Increased familiarity with IT
B. Cross-functional role of IT
C. New mandate for IT and the CIO
D. Skills demographic within the IT function

4.36 Which of the following would not be seen as a key business value deliverable from a digital strategy?

A. Improved product development
B. Improved life cycle of IT solutions
C. Improved customer retention
D. Reduced process costs

4.37 Which of the following is not a core capability for building a digital organization?

A. Flexible business model development
B. Improve customer engagement
C. Improve market analysis
D. Improve IT service desk problem management

4.38 Which of the following is not a stage in the strategy development process?

A. Matching business requirements to digital capabilities
B. Matching customer requirements to business requirements
C. Developing a vision
D. Mapping the vision to the technology infrastructure

4.39 Which of the following is a common conflict in terms of stakeholder expectations?

A. In order to grow, short-term profitability, cash flow and pay levels may need to be sacrificed
B. New developments may require additional funding through share issue or loans. In either case, financial independence may be sacrificed.
C. Cost efficiency through capital investment can mean job losses
D. All the above

4.40 Which of the following is not really an expected deliverable from stakeholder mapping?

A. Determining whether the actual levels of interest and power of stakeholders properly reflect the corporate governance framework of the organization
B. Determining the purpose and strategy and which stakeholder expectations need to be most considered
C. Determining the key blockers and facilitators of a strategy, and if they can be better managed
D. Determining how the different stakeholder will support/block any changes

4.41 Which of the following is not a key component in developing a technology road map?

A. Direction of systems development

B. Rationale
C. Budget
D. Access to latest technology

4.42 Which of the following should senior managers consider if IS and business alignment is to be achieved successfully?

A. Recognising IS as an indispensable resource
B. Recognising IS as a complex resource that must be planned and controlled
C. Recognising IS as a source for strategic advantage
D. All of the above

4.43 Which of the following strategy options will a digital business strategy help enable?

A. A low-cost leadership strategy option
B. An outsourcing strategy option
C. A differentiating strategy option
D. An outpacing strategy option

4.7 Review Question Answers

True/False Answers

4.1 F, 4.2 F, 4.3 T, 4.4 T, 4.5 T, 4.6 F, 4.7 F, 4.8 T, 4.9 T
4.10 F, 4.11 T, 4.12 F, 4.13 T, 4.14 T, 4.15 T, 4.16 F
4.17 F, 4.18 F, 4.19 T, 4.20 T, 4.21 T, 4.22 T, 4.23 F
4.24 T, 4.25 F, 4.26 F, 4.27 T, 4.28 F, 4.29 T, 4.30 F

Multiple Choice Answers

4.31 C, 4.32 D, 4.33 B, 4.34 D, 4.35 D, 4.36 B, 4.37 D
4.38 D, 4.39 D, 4.40 D, 4.41 D, 4.42 D, 4.43 D

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Chapter 5: Building Technology-based Capabilities

Learning Objectives

On successful completion of this chapter you will be able to:

- Define an organization's capability in terms of its current and future technology requirements.
- Explain how organizations can use capabilities to build competitive advantage.
- Describe how to identify an organization's dynamic capabilities.
- Identify how technology-based capabilities can influence organizational performance.
- Describe how technology-based capabilities can provide business value to the organization.
- Explain why a capability view is important for an organization's ongoing survival.
- Describe how digital capabilities can be identified for an organization.

5.1 Introduction

Without doubt, technology plays an increasingly influential role in all aspects of an organization's ability to plan, design, implement, and manage core processes and operations. Therefore, understanding and developing IT-based capabilities are important aspects of developing an organization's strategic capability. However, the default position for most organizations is not to explicitly consider IT capabilities, but IT processes, and how technology-based resources can be aligned to these processes. This is not to say that processes are not important. Indeed, they are, and how well an organization designs, implements, and manages its processes will directly affect the quality of its operations. The issue is that a good process is no guarantee of sustainable competitive performance. Internal and external environmental factors (Chapter 2: IS and Business Strategy Alignment) are pushing organizations to continually evaluate and re-

evaluate their strategies and operating practices. As technology is becoming more integral to the design of critical business processes its use and application must also be continually reviewed. Many an organization has failed to keep up with changing market forces because of its misplaced faith in a core business process. Whilst the process may have been successful, the changing competitive environment has provided opportunities not to those organizations with an effective or efficient process, but to those organizations with a *capability* to quickly change their processes in line with the ever-changing needs of their markets.

These IT influenced and influencing capabilities cannot be ignored. The potential to shape the organization's ability to respond in a timely and flexible way can in itself give the organization a competitive edge (Teece, 2013). Because of this, the IT function can no longer be seen as a support function as there now exists a real and tangible opportunity to affect the way in which the organization senses and responds to changes in market forces and conditions. What this chapter will do is discuss how to identify core capabilities, measure their impact and then put in place a development plan to improve capability performance.

5.1.1 Developing Organizational Staying Power

For organizations to remain viable they need to develop and maintain some form of competitive advantage, in effect a means of staying ahead of the competition. This need is well understood by most organizations. However, it does not traditionally form the main focus of development for the chief information officer (CIO) or the IT function. Within the IT function the main strategic and operational focus points are usually concerned with costs and delivery of service (both of which are still very important). Because of this need to deliver services in a consistent and reliable fashion, the focus on process development and management continues to be a key tool in the arsenal of the CIO and the IT function. For this reason, many of the frameworks (ITIL, CoBIT, CMMI, etc.) employed by IT managers and practitioners are predominantly process-oriented, with the intent to ensure the ongoing delivery of products and services in a reliable and controlled way. The ability to design and implement processes is an important capability for any organization, and without good process management organizations would struggle to deliver their products or services to a high quality in a scalable manner. However, as already

discussed, we now live in a fast-moving and constantly-changing world. The products and services that made an organization successful last year, do not guarantee success in the future. Organizations need to constantly align and re-align themselves to their ever-changing environments. Therefore, a failure to sense and respond to the changing needs of an organization's stakeholders can result in the development of products and services that no longer provide value for either the organization or its customers. Because of a single-minded focus on process alone, where the quality and delivery of products and services take precedence over flexibility and responsiveness, the organization may find that what it does, it does well, but what it does, is no longer relevant. Hence, well-executed processes are no guarantee of maintaining a competitive advantage, as changing external (and some internal) forces will continually challenge and impact the way things are done. Examples of some of these forces are given in Table 5.1 below.

Internal Forces	External Forces
Available resources	Introduction of new disruptive technologies
Changing skills profile of the workforce	New entrants into the market
Move from manual to automated processes	Changing customer expectations in terms of service, price, and quality
Change in strategic objectives	Changes to trade regulations
Organizational restructuring	Requirement to form strategic partnerships

Table 5.1: Examples of External and Internal Forces

The forces outlined in Table 5.1 are just examples of the types of forces that drive an organization to change; once again, for more information on internal and external forces please refer to Chapter 2 (IS and Business Strategy Alignment). Understanding how organizations sense and react to these forces is made easier through the use of standard strategy development tools such as SWOT and PESTEL to name but two. What becomes critical is no longer just the ability to develop a good, responsive process, but the ability to continually develop good, responsive processes that keep in step with the changing direction of the organization. This sustained ability is the basis of a critical capability for business process implementation and

management. This need to identify and develop capabilities that will support and build staying power can create a significant challenge for an organization. This is because:

- **Capability development requires resources:** Such as people, skills, finance, etc., which may or may not be readily available to the organization, and, therefore, may need to be sourced externally to the organization before the capability development can start.
- **Capability requirements are unique:** Capabilities required to improve performance in key operational areas will differ from industry to industry, and organization to organization. The selection of relevant capabilities will be based on the strategic plan and the ambitions of the organization.
- **Capability development takes time:** With capabilities it's not simply a case of either having them or not. Most organizations will have some capability in areas of performance, even if they are to perform at the most basic of levels. The challenge is to develop capabilities that enable the organization to perform at the desired level in line with their strategic objectives. This may take time to develop especially if it requires building specialist knowledge and skills amongst employees and strategic partners.
- **Capability development requires trust:** Understanding an organization's capabilities requires different parts of the organization to be open and honest about the maturity and efficacy of their capabilities. Some may feel that this will draw unwanted attention and criticism from senior management.

All of these challenges will continually cause organizations to re-think their strategy and current positioning within their market or competitive environment. Good business processes will ensure the organization can respond in a scalable and consistent manner. This in itself is a very important capability. However, the organization must also be able to sense and respond to new threats and opportunities. This ability is fundamental to capability development. That said, each organization will approach its market differently, and, therefore, require different capabilities to sense and respond to change. Because of this, understanding how capabilities align to the organizational strategy, are identified, and then developed is an important aspect of any strategy implementation plan.

The link to strategy is vital, as there are many ways to identify and develop capabilities. What organizations need to guard against is developing

capabilities that do not help to build competitive advantage. Organizations cannot afford to invest time, resources, and effort in developing capabilities that will not make a real difference in terms of their ability to compete.

5.1.2 Developing a Competitive Advantage

Two key concepts that underpin and influence the development of competitive advantage are:

- Organizations are not identical, but have different capabilities even within the same sectors and market places. Also, across large organizations the need for certain capabilities will vary.
- Capabilities can be difficult to obtain or copy from other organizations (capabilities are best developed internally).

If an organization is to develop a sustainable competitive advantage (SCA) it will do so on the basis of having capabilities that its rivals do not have, or have difficulty in developing. In effect, to achieve a competitive advantage, organizations should focus on those capabilities that develop a unique ability.

This concept of a "unique ability" is where the IT function can play a significant role in helping to develop the competitiveness of the modern organization. These key concepts underlie what has become known as the ***resource-based view*** or the ***capabilities view*** of strategy (Helfat *et al.,* 2008). In recognising this link between competitiveness and capability organizations are working hard to identify their key – and hopefully unique – capabilities that can be developed. As technology is now pervasive across organizations it is logical to view IT influenced and influencing capabilities as being a significant factor in defining the competitive nature of the organization. Also, by identifying those capabilities in which an organization excels or has a unique ability, versus those capabilities in which it is good or weak, can help move strategic discussions concerning outsourcing and off-shoring away from decisions centred on cost management and towards decisions centred on building competitive advantage.

To highlight the different capabilities that organizations focus on, let us take for example, Dell and Apple. Both organizations are in the technology sector, and could be considered competitors in the development and sale of

computers; even their computers contain many similar components such as memory chips, hard drives, and Intel processors. Both organizations excel at development and design, and understand their markets well. However, both organizations focus on different capabilities to help differentiate their products and offerings in their respective markets. A key capability for Apple is to understand how their customers interact with and use their products. Therefore, understanding the user experience (UX), and incorporating this understanding into the design and delivery of their products and services, is an important capability. Dell on the other hand, pays particular attention to providing its customers with a wide variety of interchangeable, and customisable products and services that can be easily accessed and purchased. For Dell, it is an important capability to have a responsive supply network that allows customers to check product availability, compatibility with existing systems, cost, and order status in real time.

The point here is that even though organizations may be operating within the same industry, and may even be targeting the same markets, different capabilities may be required to deliver their strategies.

5.1.3 Using Technology to Develop a Competitive Sustainable Advantage

As technology is increasingly playing an influencing role in all aspects of an organization's ability to plan, design, implement, and manage core processes and operations, understanding and developing IT-based capabilities are becoming more vital. These IT influenced and influencing capabilities cannot be ignored. The potential to shape the organization's ability to respond in a timely and flexible way can in itself give the organization a competitive edge. In the previous section Apple and Dell were mentioned. In Apple's case a key capability is user experience, or UX, and Dell's key capability is a fully integrated supply network. Both of these capabilities have a dependency on technology. Because of this, the IT function can no longer be seen simply as a support function, as there now exists a real and tangible opportunity to affect the way in which the organization senses and responds to changes in market forces and conditions.

As mentioned, the importance of good process management cannot be denied. However, processes in themselves are not able to assess their relevance to changing competitive conditions. Because of this, processes may be instrumental in developing or delivering a product or service in a competitive manner. However, if the organization needs to change or modify its position in the market, its ability to do so will be dependent on its ability to *change* its processes, and the rate and manner in which it responds will be dependent on the maturity of its capability. This realisation, in terms of how capabilities directly influence an organization's competitive position, is an important one, the reason being that organizations will develop and maintain many capabilities, many of which will be similar across different organizations. Some examples of capabilities found in most organizations are:

- Strategic planning
- Business process development
- Enterprise architecture management
- Customer relationship management
- Environmental scanning
- Change management
- Programme management
- Financial management
- Fulfilment management
- Supply chain management
- Marketing
- Employee recruitment and retention
- Product development

The list could go on, but it gives you an idea of the types of capabilities that can commonly exist across many different and competing organizations. Some capabilities will be better or more mature than others across these organizations. As mentioned earlier, this will depend on the time, resources, and effort that each organization has given to developing their respective capabilities. An organization's failure to realise the importance that a capability, or certain capabilities have to key strategic and/or operational objectives can become a problem. The organization's inability to respond due to poor capability will seriously impact the organization's ability to remain competitive.

Therefore, it's still important to understand what resources are available to an organization at any one time. But it is even more important to understand

how these resources are managed in a way that creates, builds, and sustains capability. An important reality check at his point is that resources, time and effort are always going to be in finite supply across the organization and as such, not all capabilities can be developed to a high level at the same time. Therefore, organizations need to be selective in how they choose capabilities for development. In order to do this, they must consider those capabilities that directly focus on and support the attainment of their core strategic objectives as being their primary focus for development.

As the modern organization has become dependent on technology for just about all aspects of its operational performance, the role that technology plays in the development and implementation of a capability needs to be properly recognised. As a resource, technology should not be simply considered as a stand-alone cost to the organization. In Chapter 2 (IS Strategy and Business Strategy Alignment) the importance of understanding how technology supports the business strategy was discussed. When we start to look at how capabilities support key business strategy objectives it is important that the role technology plays in shaping and delivering these capabilities is also understood.

So, in terms of competitive advantage the overall business strategy is going to be a key factor in achieving a position of influence and dominance in the market. However, the right capabilities will need to be developed if the strategic objectives are to be realised. As technology is vital to the development of many organizational capabilities in today's modern organization, it is vital that organizations understand how technology contributes to capability development.

5.1.4 IT-centric Frameworks

The development and growth of IT and business-related frameworks over the past 20-30 years have provided organizations with many different ways to view their technology, business, process and governance structures. As with all things, the frameworks that add value and remain relevant have survived, and those that have been seen to lose their relevance, have faded into obscurity. As most frameworks are commercial products, they will profess to offer the complete solution to managing an organization's IT needs. Many frameworks do an excellent job, but the landscape of products and frameworks can be confusing. This in itself may not be a big issue; however, many IT and business frameworks require

significant resources, time and effort to implement and manage. This is driven by the increasing scope of what they promise to cover, and the need to customise each framework to the specific needs of each organization. Therefore, selecting a framework may be easy, but the implementation and sustained adherence to a framework will require a significant amount of time, effort, and resources. Because of this, the decision to select and implement a framework needs to be made carefully.

Most of the common IT-related frameworks focus on a specific aspect of IT/business alignment. Over the past few years, as organizations seek better business and IT alignment, the frameworks have begun to overlap in certain areas. This can cause some confusion when trying to decide on a suitable framework. Table 5.2 shows an overview of some of the more common frameworks available today. The table also shows their main area of focus. It is important to note that this table is not exhaustive or complete, but simply serves to demonstrate the range of frameworks available.

Framework	Expanded Title	Focus
Agile		A set of software development methods based on iterative and incremental development based on collaboration between self-organized, cross-functional teams.
Amsterdam framework for Information Management		This framework provides a mapping of the relationship between the organization and its information needs.
BiSL	Business Information Service Library	This is a framework and collection of best practices for business information management.
CMMI	Capability Maturity Model Integration	This is a process improvement approach that helps to identify where to focus improvement efforts along an evolutionary maturity path.
COBIT	Control Objectives in IT	An IT governance framework and supporting toolset that enables managers to bridge the gap between control requirements, technical issues and business risk.

Framworx		**This is a suite of standards designed to enable service providers to assess and improve business performance by using a service-orientated approach to operations and integration.**
ISO 15504	SPICE – Software Process Improvement and Capability Determination	This framework looks at process assessment for IT processes.
ISO 27000		This is a series of information security standards that form a framework for best practices in information security management.
ISO 38500		This framework provides guiding principles on the effective, efficient, and acceptable use of IT within an organization.
IT-CMF	IT Capability Maturity Framework	This framework identifies 30 plus technology influencing/influenced capabilities against a maturity scale.
ITIL 2011	IT Infrastructure Library	This framework is focused on improving IT service management, and the way IT services align to the business.
Lean IT		This is a framework designed to improve customer value through helping to eliminate waste while delivering quality IT services.
SABSA	Sherwood Applied Business Security Architecture	A methodology for developing risk-driven enterprise information security and assurance architectures for critical business initiatives.
TOGAF	The Open Group Architecture Framework	An enterprise architecture framework to help organizations design, evaluate, and build the right IS to meet business needs.

Table 5.2: Examples of Existing IT Frameworks.

Although many of these frameworks provide real value to organizations when implemented correctly, it can be very confusing when trying to select the right framework for an organization's specific needs.

Many of these frameworks started out by trying to develop reliable processes for managing what is becoming an increasingly complex task; IT and business alignment. For many of the frameworks the original intent was to ensure core processes continued to provide quality of delivery in the most efficient manner possible. As organizations began to find themselves in increasingly dynamic and competitive operating environments, the ability to sense and respond to changes became an imperative. Simply having good, sound processes was no longer enough to remain competitive. No matter how good a process, if it could not be changed or adapted to meet the changing requirements of the organization, then the process went from being an enabler to a barrier to success. This ability, to be able to create a flexible organization, required management teams to consider the role that capability played in this new dynamic landscape.

With the exception of the IT-CMF, which has only been around since 2006, and to some extent the CMMI framework, most of the frameworks listed in Table 5.2 commenced life as process-orientated frameworks. However, since about 2010 many of the existing frameworks have begun to consider the importance of capabilities in the ongoing management of IT. Some are still focused on process, and it is important not to lose sight of the fact that good processes are still required. The difference between **process-centric** and **capability-centric** frameworks is an important one as both types focus on different aspects of technology/business performance. Comparing capability-centric with process-centric frameworks is like comparing a screwdriver with binoculars; both are tools, but for quite different tasks. Process-centric and capability-centric frameworks are designed for very different purposes:

- **Process-centric frameworks** are focused on developing an ability to produce a desired, repeatable output to a predetermined quality and quantity.
- **Capability-centric frameworks** are designed to understand which organizational abilities can and should be developed to support and build a unique and sustainable competitive advantage.

Process-centric frameworks are very much focused on systemising internal activities, whereas capability-centric frameworks are focused on developing

the ability to effectively respond to (as yet undefined) external and internal challenges. This is not to say that one framework is superior to another – this is definitely not the case. However, just as for any good tool, for a framework to be effective it needs to be applied in the correct way. Understanding processes, and how to refine and optimise them, is important if the organization is to meet the needs and expectations of its stakeholders. However, if the organization is to understand and develop its ability to sense and respond to environmental changes then it must also identify, understand, and be able to develop its capabilities.

For many senior managers, this changing perspective from a *process view* to a *capabilities view* is a new way of thinking. Thinking about capabilities means thinking for the future, but not simply in terms of budget management and technology adoption and deployment. The discussion is no longer simply about how cost can be taken out of the IT budget, but how technology can shape the way that the organization (not just the IT function) can develop capabilities that will keep it ahead of the competition.

Time Out

Think about it: Process or capability?

Abe Tanaka has recently taken over the management of the IT Technical Support Group for a medium-sized national insurance company. Up until recently the group was made up of three technicians who answered requests for support as and when they were able to. However, a recent move into the home-insurance market has necessitated a 20% increase in staffing levels across the organization. Abe's boss, Yolanda Kruff (CIO) has identified the Technical Support Group (TSG) as being important in assuring the smooth deployment and support of technology to new and existing members of staff. The TSG has now started to grow the number of dedicated customer support technicians.

In a recent meeting with her management team, Yolanda talked about the need to improve the technical support capability in order to support the growing business needs. When Abe asked her what she meant by capability, Yolanda said that technical support had been "ad hoc", and not

consistent in its responses to requests for help. Therefore, some processes needed to be in place to ensure consistency of response at all times.

Abe, who had recently read a chapter on "Building Technology Based Capabilities", was a bit confused as to Yolanda's use of the word "capability" when really just describing a need for process implementation.

Questions:

- Do you think the CIO understands the difference between "process" and "capability"?
- Considering the growth and change in direction of the organization (new channels to market), should Abe be solely focused on process implementation, and forget about capability building?
- How would you define the capabilities that Abe and the team should be considering?

5.2 Why are Capabilities Important?

Recent years have witnessed a surge of interest in the notion of capabilities as an important source of competitive advantage. This recognition has, in turn, placed emphasis on the question of where and how these capabilities emerge and how they influence firms' performance (Ethiraj *et al.,* 2005).

Acquiring and embedding technologies within an organization are no guarantee that they will be used in an effective manner. If organizations are to realise the potential of their digital resources then they need to develop capabilities around these resources. By taking a capability view, organizations can better assess those resources that are critical to delivering against their key strategic objectives. As mentioned, the importance of good process management cannot be denied. However, processes in themselves are not able to assess their relevance to changing competitive environmental conditions. Because of this, processes may be instrumental in developing or delivering a product or service in a competitive manner. However, if the organization needs to change or modify its position in the market, its ability

to do so will be dependent on its capabilities; and the rate and manner in which it responds will be dependent on the maturity of those capabilities. This uncertainty, in terms of what the competitive landscape will develop into, and how technology will continue to be a disruptive force in forming this landscape, will shape the focus of all those concerned with their organization's strategy. Furthermore, this focus is not solely for those in IT organizations, but also for all those who use technology as an enabler for their business. Developing capability is a key component in developing competitive advantage. However, organizations may still have limited resources in terms of finance, skills, and technology. So, the question is, what capabilities should they focus on?

The answer is not as difficult as it may first seem. In order to build competitive advantage, organizations should focus on developing those capabilities that are unique to them and that can help differentiate them from their competitors, and if possible are not easily copied. A capability that is difficult to copy is vital in developing a sustainable competitive advantage; the longer an organization can maintain the advantage gained through its unique capability, the slower the competition is in closing the competitive gap.

5.2.1 Assessing the Value of your Capabilities

This, in itself, is an important organizational capability. We traditionally look to our processes as indicators of capability, but this is only an indicator at a low level of capability maturity. Processes, and the support structures (people and technology) that wrap around them, may have worked well in the past but may now not be fit for purpose within a new competitive landscape. This may give the impression that a particular IT or business function responsible for those processes is no longer required. However, by taking a capability view the organization may re-evaluate how it utilises IT in terms of its future potential capability; a necessary perspective when planning for future success. It is worth noting that competitive value is not in a particular process *per se*, but in the ability to continually evaluate, modify and develop processes in line with changing organizational needs. This capability view forces the organization to look at not only what it does now, but what capabilities it needs for the future.

The concept of a maturity profile for assessing capability is not a new one. In 1987 Carnegie Mellon University's Software Engineering Institute (SEI) started to develop the Capability Maturity Model Integration (CMMI) framework for assessing the maturity and effectiveness of software development processes. As the SEI was developing the CMMI framework, the developers realised that having, or not having software processes was too broad an indicator of performance. The successful operation of any process would depend on more than simply its existence. The manner in which the organization's stakeholders could develop, modify, engage with, and support processes would also be a factor for success. The SEI used this approach to develop a maturity profile for critical software development processes (see Table 5.3). This maturity profile would not just simply indicate whether a critical process existed or not, but how well integrated and relevant it was to the business of software development. This maturity model was then adopted and modified by the Innovation Value Institute (IVI) in 2006 to develop the IT Capability Maturity Model (IT-CMF). IVI's framework was focused on helping organizations assess the current maturity of their IT capabilities, and then provide a road map to help develop that maturity.

The maturity model is designed to develop a three-dimensional model that not only identifies if a capability is present, but also how effective the capability is at delivering business value for the organization.

Level	Characteristic	Description
5	Optimised	World-class demonstrated; significant optimization/improvement focus.
4	Advanced	Very good or excellent in virtually all aspects; no real debilities.
3	Intermediate	Reasonably good approaches present may have slight deficiencies.
2	Basic	Elementary approaches emerging, some serious (but non-fatal) weaknesses.
1	Ad hoc/Initial	Inadequate approaches, potentially fatal flaws prevail.

Table 5.3: Maturity Summary (IVI, 2007)

At lower levels of maturity (levels 1 and 2) the capability may be present but it has not been integrated with or aligned to the organizational need in any structured or consistent manner. As the capability reaches level 3 it is being demonstrated in a consistent and effective way throughout the organization. Levels 4 and 5 start to see the capability as driving real and sustainable value for the organization. However, the work practices and culture may need to change significantly for an organization to achieve these levels. In effect, transformational change across the organization may be required to reach higher levels of maturity.

It is important to note that this maturity profile should not be seen as a requirement for all capabilities to attain level 5. Because of the dynamic nature of the operating environment the needs and requirements of the organization will constantly change over time. Considering the definition for dynamic capabilities, and awareness of the need for change, it is important to realise that capabilities will not always remain "dynamic", or relevant to the organizational need. The organization must continually assess and reassess its capabilities and resources to identify those capabilities that are necessary now, and those necessary in the future for ongoing organizational success. Focusing on the development of capabilities when they are no longer relevant will not only tie up vital resources, but also impact the organization's ability to respond to changes in its competitive environment.

5.2.2 Dynamic Capabilities

Teece *et al.* (1997) define **dynamic capabilities** as capabilities that an organization has to shape, reshape, and reconfigure the firm's asset base so as to respond to changing technologies and markets. Helfat *et al.* (2007) provide a more succinct definition. They define a dynamic capability as

"…the capability of an organization to purposefully create, extend, or modify its resource base."

Helfat *et al.* (2007)

Both definitions are not meant to be all-encompassing in their scope, but instead try to capture the relationship between a capability and

the need to continually shape and reshape how resources are utilised in order to improve competitive performance and positioning.

What makes this challenging for organizations is that their dynamic capabilities will change over time. The capabilities that are critical to remaining competitive will change depending on the strategic direction and operational requirements of the organization. Therefore, considering the time and effort needed to develop capability maturity, organizations need to know which capabilities are not only important now, but also will be important in the future. This underlines the importance of understanding how capabilities impact organizational strategy.

5.2.3 IT-CMF: A Framework for Defining IT Capabilities

The ever-present nature of technology, and the way it has become an integral part of just about every aspect of organizational and personal life, makes it vital that capabilities that are influenced by, or are influencing technology are not overlooked. The notion that capability refers to the manner in which an organization manages and develops its resources must be extended to how it manages and develops its technology-based resources as well. It is no longer simply enough for an organization to possess technology; it should also be managed and developed in a way that helps build competitive advantage.

Because of the integrated nature of technology, we cannot simply think of technology solely in technology terms; for example, only consider the hardware and software components of the IT resources, such as storage, communications, data warehousing, and cloud capabilities. Technology-based capabilities must also consider other aspects such as the technology supports for processes, the skills of the individuals who interact with the technology, and how the technology is utilised to shape organizational performance. It is the mix of people, processes, and organizational structure that defines how technology can add value to the organization in terms of improved performance and competitive advantage.

Many frameworks, such as COBIT and ITIL, are now beginning to include a capability perspective for their users. However, for the purpose of explaining what a technology influenced/influencing capability looks like, and how these capabilities can mature, the most comprehensive framework

that does this at the moment is the **IT Capability Maturity Framework** (IT-CMF). The Innovation Value Institute (IVI), a research institute based at Maynooth University in Ireland, has been responsible for maintaining this framework. The IT-CMF, as of 2019, identifies 35 IT-related capabilities. These capabilities range from more business-related capabilities such as strategic planning, to more technical capabilities such as technical infrastructure management. The range and scope of the capabilities are quite broad and provide one view, which is by no means complete, of the capability landscape. However, what the IT-CMF does is provide the organization with a clearer view of many of the main capabilities that technology will be part of, which are necessary for not just IT performance, but also business or organizational performance. The 35 capabilities are then grouped under four headings:

- **Managing IT like a business**: The capabilities related to directly optimising the contribution of technology to the organization as a whole.
- **Managing the IT budget**: The capabilities related to managing the IT budget, or finances.
- **Managing the IT capability**: The capabilities associated with the provision of IT services and solutions to the organization.
- **Managing IT for business value**: The capabilities focused on ensuring investments in IT are explicitly linked to business benefit.

The real advantage and value of the IT-CMF is not that it simply defines each capability, but that it also defines what these capabilities are expected to look like at different stages of maturity. So, it's not simply a question of either having or not having a capability, but of being able to determine the maturity and, therefore, the impact of the capability on the organization. Table 5.4 outlines the maturity level profiles against which each capability's respective maturity is assessed.

As you can see from the maturity-level heuristics in Table 5.4, the definitions for each level across "approaches", "scope" and "outcomes" are quite general, and could be applied to capabilities from any part of the organization. As already stated, organizations will have finite access to resources, time and funding and so the choice of capabilities to be developed will need to be carefully made.

Maturity Level	Approaches	Scope	Outcomes
1 – Ad hoc/Initial	Approaches are inadequate and unstable.	Scope is fragmented and incoherent.	Repeatable outcomes are rare.
2 –-Basic	Approaches are defined, but inconsistencies remain.	Scope is limited to a partial area of the business function or domain area; deficiencies remain.	Repeatable outcomes are achieved occasionally.
3 – Intermediate	Approaches are standardised, and inconsistencies are addressed.	Scope expands to cover a business function (typically IT) or domain areas.	Repeatable outcomes are often achieved.
4 – Advanced	Approaches can systematically flex for innovation adaptation.	Scope covers the end-to-end organizational/neighbouring domain areas.	Repeatable outcomes are very often achieved.
5 – Optimised	Approaches demonstrate world-class attributes.	Scope extends beyond to the border of the organization/neighbouring domains	Repeatable outcomes are virtually always achieved.

Table 5.4: General Maturity-level Heuristics (Curley *et al.,* 2015)

5.2.4 Identifying which Capabilities are Important to your Organization

Capability development is key to building a responsive and dynamic organization. As Teece (2009) said…

"*…dynamic capabilities relate to the firm's ability to proactively adapt in order to generate and exploit internal and external firm specific competencies, and to address the firm's changing environment.*"

(Teece, 2009)

However, not all capabilities will directly influence an organization's ability to develop a sustainable competitive advantage. There is a view within strategic management that, based on finite access to resources, an organization should focus on key capabilities that are unique and difficult for competitors to replicate. Therefore, consideration must be given to which capabilities differentiate the organization from the competition now and in the future, and how these capabilities can be developed. This organizational self-awareness is a characteristic of higher levels of capability maturity. The ability to continually sense and respond in a proactive manner to changing environmental conditions is where organizations really start to see value-added, particularly in terms of organizational performance. Organizations that can develop a high level of maturity around a unique capability are in effect, directly shaping and building a competitive advantage.

There are many examples of organizations which have realigned critical resources to focus on building capabilities, whilst divesting themselves of capabilities that don't really add any competitive difference. For example, many universities outsource certain activities such as catering, security and utilities management to third-party companies. These are capabilities that do not add anything in terms of attracting students or research funding. However, these capabilities are still required, but they are better provided by third-party organizations that specialise in them. In this way, universities can focus on developing their learning, teaching, and research capabilities. Manufacturing is another area where many organizations have realised that whilst they may be good at manufacturing, there are other organizations that are better at related capabilities such as logistics, the procurement of parts, and even design and development. This has seen many traditional manufacturing organizations such as IBM, Dell, and Apple outsource parts of their manufacturing capabilities to third-party organizations, such as Foxconn, Acer, and Sanmina SCI. This has allowed them to re-focus their resources on building capabilities around user experience, design, marketing, supply chain management, etc.

The challenge for organizations is developing a clear view of what needs to remain a key focus in terms of capability development, and what can be

stopped, or outsourced. These capabilities will differ from organization to organization. However, in terms of the capability landscape the IT-CMF gives organizations a clear and descriptive overview of the spectrum of IT-related capabilities shaping performance. How good you are (level of maturity) with each capability will depend on a number of things, such as operational focus, leadership and management styles, external market forces, historical positioning within the market, legal obligations, the current resource level, performance figures, new product and services programmes, overall strategy… the list goes on, and the mix of these influencing factors will be different depending on the organization in question.

That said, Figure 5.1 (Capability Development Matrix) highlights how capabilities can be assessed in terms of their uniqueness and strategic fit within an organization. The starting point here is to assume that all capabilities identified within the organization have some potential to add value whether that's in terms of competitive advantage or just day-to-day operational requirements, such as cleaning, catering, or transport. If an organization identifies a capability that has no discernible or potential benefit to the overall performance of the organization, it should as a matter of priority consider re-allocating any resources used to maintain that capability.

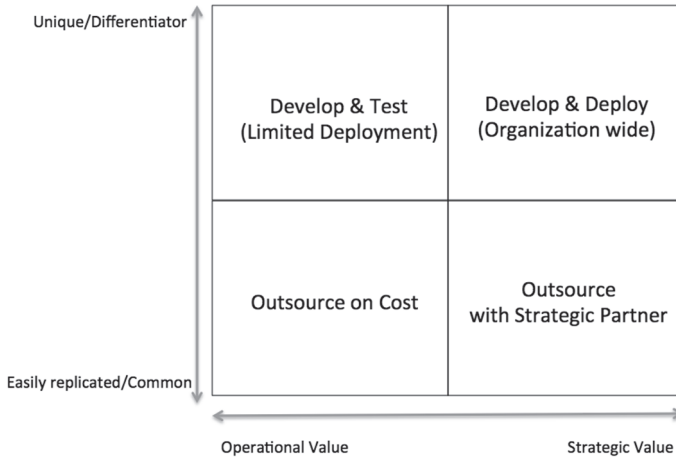

Figure 5.1: Capability Development Matrix

For example, if your organization is a legal firm specialising in mergers and acquisitions, then printing, catering, and basic health and safety training might be important to you, but not something that you would wish to develop as an internal capability. Therefore, outsourcing these activities to the most cost-effective supplier might be the best option. If, however, the organization has developed a unique capability that allows the quick and accurate assessment of potential risks to mergers and acquisitions then this capability needs to be developed and made available across the entire organization. This does not mean everyone in the firm needs to be able to do the assessment, but that the capability can be accessed from any part of the organization.

Another example might be an organization that builds high precision valves for medical devices. Demand has increased significantly in the Asian market, but the organization does not have the resources to build a manufacturing facility in that region. Therefore, it may make sense to form a strategic partnership with a local manufacturer to build and ship the valves within the Asian market. The last example is where an organization finds it has developed a capability that has unique properties, but as yet, it has no strategic value to the organization. The organization might see this capability as having some future value to the organization and, therefore, it should be investigated further. This happened to IBM during the early 2000s. IBM had developed a significant capability around procurement to support its vast manufacturing operations. However, as IBM started to outsource its manufacturing, the need for a procurement capability became less relevant. However, because of IBM's size and reputation the procurement operation could offer benefits from economies of scale and competitive credit agreements. On realising this, IBM started to develop a procurement capability that it could outsource to other companies. In effect, IBM's procurement capability was used to benefit other organizations' procurement requirements.

Time Out

Think about it: Focusing on the right capabilities.

The insurance company that Abe Tenaka and Yolanda Kruff work for has become very successful. Over the last five years the company has grown into a multi-national business. This successful growth has been due

to the organization's ability to sense new opportunities and act accordingly. The company, Trans-Insure Ltd., has gone from being a national operator to having businesses in 18 countries including India, China, Brazil, North America, and various countries across the European Community.

Abe's Technical Support Group (TSG) has also grown significantly over the last five years, and he is now responsible for over 120 staff. As expected, the TSG is seen as being a significant cost to the organization. Six months ago, a new CEO joined who is keen to focus on reducing costs in light of an apparent slowing down in the market. As the TSG is not directly involved with sales or lead generation, the CEO has asked Abe (now Director of Technical Support) to review the costs of running the TSG and to come up with a plan to reduce costs by 10% across the group.

Abe knows that business priorities change, and the organization must also change to accommodate these new priorities. However, he feels that simply taking a percentage cut across the TSG will not be good in terms of maintaining the operational efficiency of the group. Abe knows there are many aspects to the services that the TSG provides, with some being more important to the organization than others. Abe wonders if maybe taking a capability view of the TSG operation might give him a better understanding of where savings could be made that would least impact the operational performance of the business.

Questions:

- Do you think a capability view of the TSG operation would benefit at this stage? If so, how?
- Could the use of the capability development matrix help to identify aspects of the TSG operation that could be terminated, downsized, or outsourced?
- What capabilities do you think the TSG would possess? Is there a way that any of these capabilities could be developed into dynamic capabilities?

5.3 The Rise of the Digital Organization

The term "digital" seems to be a consistent component of most senior management conversations these days. The topic is also not limited to just those in the IT profession, or IT departments, but is being driven and shaped by questions from across the business (marketing, sales, finance, operations, R+D, IT, HR, etc.) (McDonald, 2012).

The cause of this increasing level of demand for better technology utilisation is largely down to a number of relatively recent advances in technology. However, the catalyst for the step change in demand can be put down to a number of key technology advancements:

Technology Advancement	Impact
Improved broadband speed (fibre optics)	An improved ability to access and download and upload media-rich content.
Increase in wi-fi availability	Providing continuous access to internet services and content.
Reduced cost for storage devices	Providing scalable, affordable, continually accessible virtual data storage.
Introduction of affordable mobile smart device technology	Accessible, compatible tools for continued internet access. Driving up demand for online content.

Table 5.5: Impact of Advances in Technology

These technological advances have, in turn, allowed for the development of software applications and follow-on technologies. The purpose of these technologies is to meet the needs of organizations working to maximise how best to use technology to build competitive advantage, or improve organizational performance.

Applications and follow-on technologies are plentiful and continually being updated, modified, and/or replaced. However, they can broadly be grouped into four core areas. These areas define what "digital" means from a technology perspective – but do not provide any real clarity from a business or organizational perspective. The four main digital enabling technology areas can be classified as follows:

Digital Area	Description
Big Data	Increasing the volume of and access to internally and externally generated structured and unstructured data sets.
Cloud	Virtual, adaptable and secure internet-based storage, and application hosting.
Mobile	Mobile devices that are connected to the internet.
Social	Internet-based social media sites.

Table 5.6: Key Areas for Digital Technologies

What makes the "digital" discussion interesting is not the technology underpinning it, but the questions and concerns it is raising within organizations (both in the public and private sectors). Listed below are some points that help to describe the nature of what it means to be digital.

- This is no longer a topic of conversation solely relating to IT.
- Everyone has a view of what "digital" means.
- No one is really sure who should take the lead in implementing a digital programme.
- Technology is fundamental to digital, but it is not the only thing to consider.
- The focus is moving from managing data to accessing information.
- The technologies at the heart of the digital discussion have yet to be fully understood in terms of their impact on organizational performance.

One must realise that everyone, including academics, consultants, software and hardware providers, IT professionals, and marketers will have an opinion that is shaped by their own view of their organization's technology and performance needs. What is causing this differing perspective is the way in which the digital discussion transcends all aspects of the organization.

Fundamentally, "digital" is about improving access to information that will enable timelier, and cost-effective decision-making, which in turn will build a more responsive, customer-focused organization. In short, the goals of any "digital" agenda or strategy should encompass at least the following:

- Providing information for better business decision-making (**improved decision-making**).
- Developing a responsive customer-focused organization (**improved customer engagement/retention and acquisition**).
- Developing flexible and responsive business models (**improved organizational responsiveness**).
- Developing demand sensitive products and services in a cost-effective manner (**improving the cost of producing digital products and services**).

Therefore, digital is more about "intent" in terms of what is required to improve organizational responsiveness and performance. It is not so much about the technology used to achieve the goals outlined above. Technology will continue to change and improve, and organizations will continue to try and understand how best to adopt and integrate it into their businesses. "Digital" is not important because of the technology that currently underpins it, but because of the way it is causing organizations to re-think how they view technology, and the role it plays in supporting their businesses (Mithas *et al.,* 2013).

5.3.1 A Changing Perspective on Capabilities

So how does the changing perspective on the way in which technology needs to support organizations in the "digital age" differ from the more traditional IT enabled era? A good place to start would be with a framework developed by Feeny & Willcocks (1998), which looked to identify the core capabilities needed for any successful organization. The framework developed by Feeny & Willcocks (1998) is called the **Nine Core IS Capabilities framework** and is visually represented in Figure 5.2. The framework is made up of three overlapping core groups titled as follows:

- Business and IT vision.
- Design of IT architecture.
- Delivery of IS services.

It is important to note that the advent of the "digital" paradigm has not removed the need for IT or IS management across the organization. It has simply re-focused the view of IT from the provision of technology to the

provision of information. Therefore, the three core capability groups as identified by Feeny & Willcocks (1998) are still valid. However, the "digital" perspective requires a much more holistic view of how technology is adopted, aligned, and integrated across an organization. Having the latest technology is no longer a guarantee of success; it's how the technology is used to support the business that will determine the level of overall success that the organization achieves.

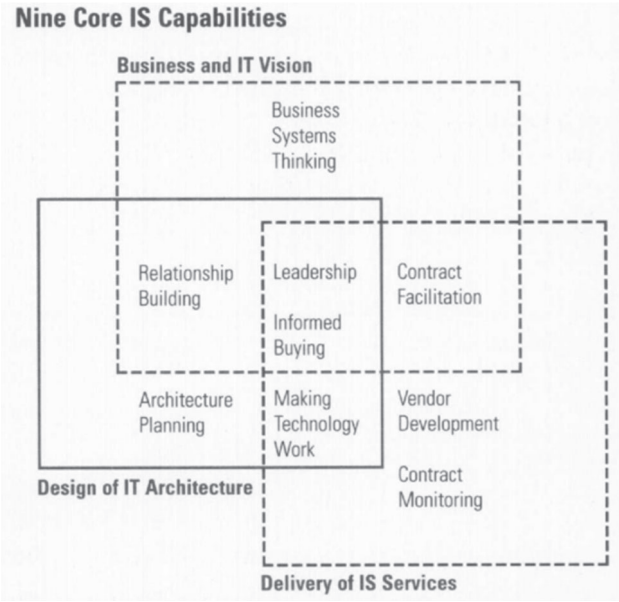

Figure 5.2: Nine Core IS Capabilities (Feeny & Willcocks, 1998)

Feeny & Willcocks developed their framework to support organizations faced with an increasingly volatile market place, increased competition through global competition, and the increasing power of the consumer. However, the advent of digital services and the increase in consumers switching to digital markets through mobile technologies, were yet to become key factors in how organizations re-evaluated their technology capabilities and developed their core business models.

5.3.2 Capabilities for a Digital Organization

Much has been written about the nature and composition of dynamic capabilities, and their importance in defining and implementing successful strategies. However, recent advances in technology have changed the way organizations engage with technology: cloud, data analytics, mobile, and social media to name the most common. These technologies are for some organizations reshaping their ability to effectively compete within their chosen markets. The question is what dynamic capabilities do they need to ensure their technology is adding business value?

In 1998 Feeny & Willcocks published a paper in the Slone Business Review titled "Core IS Capabilities for Exploiting Information Technology". This identified and outlined a set of capabilities relating to information systems that they (1998) believed were central to any organization looking to improve performance or business value through technology.

Since 1998 the world has changed dramatically. During this relatively short time we have seen the introduction of email, high-speed broadband, social media, and mobile technologies, and the wide-scale accessibility of low-cost compatible technologies. Technology has gone from being an enabler to being a commodity, to once again being an enabler in that it can directly influence an organization's ability to innovate around the design, development and launch of new products and services (Wade *et al.,* 2011). Organizations are becoming more dependent on technology, irrespective of their sector, to remain competitive and to help build a distinctive presence in an increasingly competitive and dynamic environment. The nature of organizational competition has changed significantly. The nature of the competitive market has shifted from a neoclassical static competitive environment to a Schumpeterian competitive environment (Teece, 2013; Schumpeter, 1911).

This environment of Schumpeterian competition is characterised by dynamic competition, rapid technological change, and the growth and importance placed on intellectual property (Crandall & Winston, 2005). All of these characteristics have been affected and stimulated by the advances in technology experienced, so far, through the first few years of the 21st century. In order to stay competitive, organizations have not only had to

adopt and integrate technology into their operating processes, but have had to alter the way they interact with technology.

A term that is being used to encompass the idea of better integration and alignment of technology to support organizational and customer requirements, is "digital". The notion of a "digital organization" is one that has harmonised the use of technology with its need to stay viable and competitive.

However, there is a lot of confusion with the notion of "digital" that is not being helped by organizations viewing it as a uniquely technology-centric activity. For many, "digital" is just a term to group together the latest set of internet enabled and enabling technologies. Although "digital" is dependent on, and certainly enabled by such technologies, this is a significant over-simplification of the "digital" concept. "Digital" represents a shifting paradigm in how organizations now need to view and engage with technology. The actual technology itself is not so important, as it will continue to change and evolve over time. What is important, however, is how organizations, employees, customers, and any other stakeholders re-think how they use technology to build competitive, innovative products and services in a way that develops competitive advantage (Setia *et al.,* 2013).

According to Feeny & Willcocks (1998), the importance of human-centric capabilities such as leadership, planning, facilitation, and relationship building also needed to be stressed (Figure 5.2). However, the organizational perspective is changing. IS and IT are for many organizations no longer separate functions, but seen as a more integrated aspect of the overall business, or corporate strategy (Mithas *et al.,* 2013). Technology integration is a costly endeavour, and one that many organizations cannot afford to get wrong. Therefore, the need to better understand how technology will impact an organization's ability to respond to environmental factors, and enable the achievement of strategic objectives is no longer an IT issue, but an organizational issue (Bharadwaj *et al.,* 2013).

5.3.3 Defining Dynamic Technology Capabilities

In terms of a dynamic technology capability this chapter simply introduces the notion of technology into the more commonly accepted definitions provided by Teece (1997) and Helfat *et al.* (2007). Therefore, we will define "dynamic technology capabilities" as follows:

Dynamic technology capabilities are those capabilities that are either influenced by technology, or influence how technology is used to build competitive advantage, or improved performance for an organization. The dynamic technology capability is in effect a subset of all dynamic capabilities.

The output and focus remain the same for dynamic technology capabilities and dynamic capabilities, i.e., to improve the competitive positioning of any organization.

According to Teece (2013) and Dosi *et al.* (2001), the dynamic capability approach looks to provide organizations with a coherent framework for developing and managing capabilities in a way that will build competitive advantage. Basically, by focusing on dynamic capabilities an organization can build the foundations necessary for growth and prosperity.

That said, it is important to consider the "**Penrose effect**" and its influence on the identification and weighting of capabilities that are seen to be important to any organization (Penrose, 1995). Penrose argued that the resources and capabilities necessary for growth and prosperity will vary from organization to organization, irrespective of whether they are in the same sector or not. Because of this, it is not realistic to identify specific capabilities that will have the same level of importance or relevance across all types of organization. Therefore, the existence of the nine core IS capabilities as posited by Feeny & Willcocks (1998) is not the concern when assessing an organization's capability landscape. What is important is the relevance these capabilities have to the particular organization in question. The challenge, and value to organizations, is not to identify whether the core capabilities are present, but how mature the capabilities are, and their relevance to the organization's operating environment and strategy (Ross *et al.,* 2011).

5.3.4 Building a Maturity Profile for Dynamic Technology Capability Management

To identify the technology capabilities that are influential in the success of new digitally enabled organizations, three capability areas, that take a business-centric view, are defined as follows:

- **Aligning technology to the business**: What capabilities are necessary to align technology to core business processes, and the overall business strategy? (***Selecting the right technology.***)
- **Integrating technology with the business**: What capabilities are necessary to ensure technology is effectively integrated into core business processes that support critical business functions? (***Implementing the right technology.***)
- **Adopting technology into the business**: What capabilities are necessary to ensure technology is adopted quickly and effectively by all organizational stakeholders (employees, customers, suppliers, etc.)? (***Using the right technology.***)

These are supported by the following additional capability areas:

- **Managing technology**: How well is the technology managed in terms of service delivery, maintenance, transition, and change?

- **Business and technology leadership**: How well is technology aligned to the business strategy and then implemented accordingly? Is the technology simply delivered as a service, or is it seen as a way to innovate and drive competitive advantage?

When dynamic capabilities are expressed in terms of these five capability areas the scope and breadth of capabilities increase beyond those nine as originally identified by Feeny & Willcocks (1998). The importance and relevance of dynamic technology capabilities will vary depending on the challenges facing an organization at any one time and the strategic choices being made. Because of this, there is no specific weighting of importance across four of the capability areas. However, without effective "business and technology leadership", effective and sustainable alignment and integration of technology into core business processes will not happen.

Figure 5.3 provides a visualisation of how the dynamic technology capability areas inter-relate with each other (McLaughlin, 2016). Because of the shift from a technology-centric capability view to a more business-centric capability view the three capability areas as outlined by Feeny & Willcocks (1998) have been changed. However, the nine capabilities they identified still remain in the new dynamic technology capability model (DTCM) (Figure 5.3).

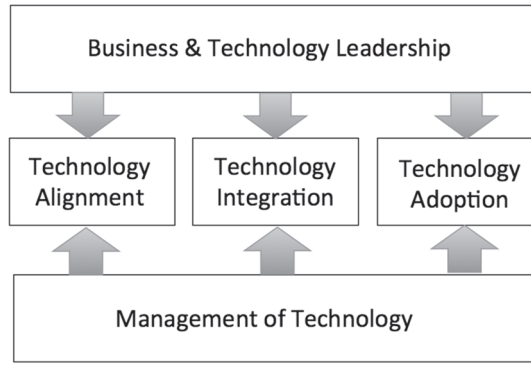

Figure 5.3: Dynamic Technology Capability Model

5.3.6 Defining the Core Dynamic Technology Capabilities

The DTCM draws on the IT-CMF as it has already identified over 35 critical IT capabilities as part of its capability maturity framework model. However, the identification of dynamic technology capabilities will not be constrained by those capabilities defined in the IT-CMF, nor does the DTCM draw exclusively from the IT-CMF, but it identifies additional capabilities where necessary to fill any gaps in the model.

The table below highlights the capabilities that are considered as part of the DTCM. Feeny & Willcocks' core capabilities have been mapped onto the IT-CMF's capabilities to provide more definition.

Core Capability Feeny & Willcocks (1998)	Equivalent Critical Capability IVI (2017)	Definition
Business System Thinking	BPM, RAM	Business Process Management, Relationship Asset Management
Relationship Building	RAM	Relationship Asset Management
Contract Facilitation	SRC, SUM	Sourcing, Supplier Management
Leadership	ITG, IM, RM	IT Leadership & Governance, Innovation Management, Risk Management
Informed Buying	SD, SUM, SRC	Solution Delivery, Supplier Management, Sourcing
Making Technology Work	SD, UED, RDE	Solution Delivery, User Experience Design, Research Design & Engineering
Architecture Planning	EAM	Enterprise Architecture Management
Vendor Development	SUM	Supplier Management
Contract Management	SUM	Supplier Management

Table 5.7: Capability Comparison

The nine core capabilities map onto 11 critical capabilities as defined by the IT-CMF. The main benefit for using the IT-CMF capabilities is that they can already be expressed in terms of a five-level maturity profile. Because of the way in which IT-CMF capabilities are structured, there is some degree of cross-over between the IT-CMF capabilities and the scope of Feeny & Willcocks' defined capabilities. For example, this can be seen in the case of information buying, vendor development and contract management where there is some commonality with aspects of the supplier management (SUM)

capability. This is because the SUM capability is broken down into capability building blocks that look at the following:

- Supplier engagement;
- Supplier communications;
- Order management;
- Contract management;
- Supplier development;
- Supplier risk monitoring; and
- Performance measurement and monitoring.

All of the IT-CMF capabilities are similarly constructed, with each capability being made up of between 6 and 21 capability building blocks. These building blocks, or capability components, allow the capability to be deconstructed and better evaluated. The higher-level capability title, such as supplier management, is too broad to provide any real understanding as to how the capability is being developed, or adding value across the organization. Breaking down each capability in this way allows an organization to better understand where and how capabilities are performing, and where and how resources need to be applied to build and improve the capability.

As discussed, the digitally enabled organization looks to integrate new and emerging technologies more seamlessly into its operating environment. The need to better understand and respond to changing customer needs is paramount to remaining competitive (Gallouj & Windrum, 2008). Therefore, the capabilities necessary to ensure cohesion and alignment between technology and core business processes are not simply IT-focused. These capabilities are still important, but the types of capabilities, as expressed by Feeny & Willcocks, need to be expanded.

In terms of the DTCM, the framework takes capabilities from the IT-CMF and these are mapped onto the model as shown in Figure 5.4 below.

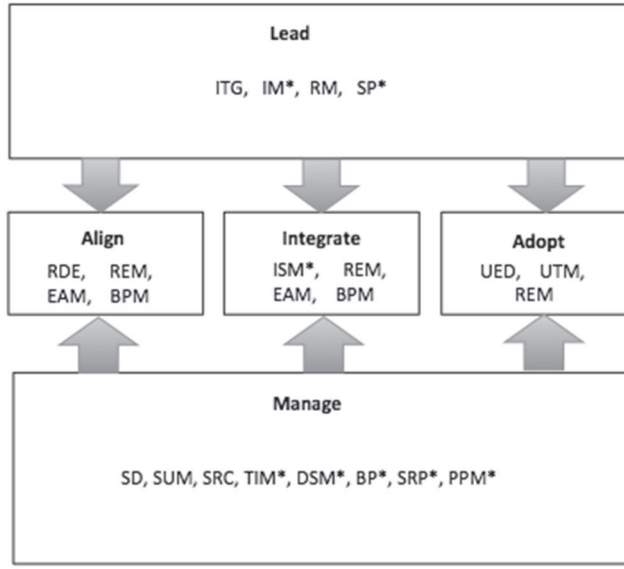

Figure 5.4: DTCM with Capabilities

There are a number of new capabilities, not identified in Table 5.7, and these are included in this model identified with an asterisk. These are as follows (from top to bottom):

SP	– Strategic Planning
IM	– Innovation Management
ISM	– Information Security Management
TIM	– Technical Infrastructure Management
DSM	– Demand and Supply Management
BP	– Business Planning
SRP	– Service Provisioning
PPM	– Programme and Project Management

Innovation management and strategic planning have been added to the leadership section. This is to reflect the growing importance that innovation plays in the use of technology, not just looking at innovative technologies, but at how technology can be utilised in innovative ways to support the business (Hao & Yu, 2011; Bartel *et al.,* 2007). This underlines the importance of alignment between the provision of technology and the

business requirements. Those responsible for leading the technology agenda must understand how the organization operates, what its strategic goals and objectives are, and how technology can help to build competitive advantage (Earl, 1996). Therefore, the second capability to be added is **Strategic Planning** (SP). This capability relates to how well the organization can keep technology and business strategies aligned. Without effective alignment between the two, successful implementation will be more a function of chance than planning (Kearns & Sabherwal, 2007).

The next capability to be added is **Information Security Management** (ISM). This is included to ensure organizations can respond and react effectively and securely to new technologies. In particular, with the advent of BYOD (bring your own device), many organizations have to cope with managing multiple data access requests for a diverse range of internet enabled technologies. Organizations that are better at responding to these requests, whilst ensuring the security of their core data and information, will be able to respond to customer demands faster without compromising their own security (Kayworth & Whitten, 2011; Da Veiga & Eloff, 2010; Smith *et al.,* 2007).

The last five capabilities to be added all reside in the management area. The first of these is **Technical Infrastructure Management** (TIM). This capability looks to increase the business value of the technical infrastructure by shifting the management focus from a technical perspective to a business perspective. Within an increasingly complex and technically interconnected organization it is vital that the key driver for the management of technology is increasing business value (Byrd & Turner, 2001; Melville *et al.,* 2004).

The next management capability to be added is **Demand and Supply Management** (DSM). This capability is responsible for managing the balance of supply-of-IT services to the changing demands of the business. Within an increasingly volatile and dynamic competitive environment the ability to sense and respond to changing demand could mean the difference between reacting to a business opportunity, or failing to keep in step with the changing market demand (Greenan *et al.,* 2009; Peppard & Hemingway, 2009). DSM focuses on building capability around analysing current and future business demand profiles and identifying gaps between supply and demand.

Business Planning (BP) has also been added as a capability as it develops an ability to create effective business plans that address both operational and change management aspects of IT activities. This capability ensures that the key business and IT stakeholders engage in a shared ownership process when developing business plans that reflect current and future technology focused investment. This is a vital element of ensuring the alignment of the business and IT requirements (Ward *et al.,* 2008).

No matter how well technology has been deployed within an organization, its usage and services still need to be managed effectively, and efficiently (Melville *et al.,* 2004; Lu, 2011). This is where the **Service Provisioning** (SRP) capability is critical. SRP is the execution of IT services to satisfy the business requirement. Services in this case comprise people, processes, and technology.

The last capability to be added to the management section is **Programme and Project Management** (PPM). This capability is not simply about the development of good project management skills. It is about developing an organization-wide ability to plan, organise, manage, and optimise resources for programmes and projects, to manage the associated risks and issues, and to ensure all associated changes are expediently handled. The emphasis here is on the ability to effectively handle multiple, complex, and mission-critical technology-driven projects in a way that does not negatively impact on the organization's ability to operate.

It is worth noting that Feeny & Willcocks (1998) have identified project management as a core skill as opposed to a capability. However, considering the nature of technology-based transformational change, and the importance of getting it right first time, a good programme and project management capability is central to ensuring that transformational-change projects are implemented successfully. Therefore, they are included in this model. In all, the DTCM encompasses 19 core capabilities that need to be considered when building a digitally enabled organization. The capabilities are broken down into their component parts, or capability building blocks, to give more insight into the scope of each capability. A more structured breakdown of each of the 19 core capabilities is provided in Table 5.8. The table identifies each capability and also the component or capability building blocks that go into making up each capability. This gives a clearer indication of the scope of each capability.

Capability	Title	Building Blocks
ITG	IT Leadership & Governance	Value orientation, Business interaction, Communication, IT vision, Style culture & team building, Decision bodies & escalation, Decision-making process, and Reporting and oversight.
IM	Innovation Mgmt.	Vision, Strategic planning, Funding & resource allocation, Portfolio management, Management leadership, Acceptance of risk-taking, Collaboration, Capability development, Roles and responsibilities, Rewards and recognition, Processes, Frameworks, Measures of impact, and Communication of value.
RM	Risk Mgmt.	Policies for risk management, Integration, Management governance & performance management, Communications and training, Definition of risk profiles, Risk coverage, Assessment, Prioritisation, Handling, and Monitoring.
SP	Strategic Planning	Formation, Communication, Alignment with the business, IT vision and principles, Strategic options, Strategic plan, Tracking & evaluation, and Linkage to related processes.
RDE	Research Design & Engineering	Business alignment, Collaboration, Research project governance, Up-front analysis, Phase deliverables, Culture, Investment budgeting, and Measurement of RDE impact.
REM	Relationship Mgmt.	Understanding organizational relationships, defining relationship structures and plans, Developing IT communications programmes, Defining IT information requirements, Championing IT to the business, Championing the business to IT, Developing and monitoring relationships, Detecting and responding to exceptions.
EAM	Enterprise Architecture Mgmt.	Strategic planning, Architecture planning, Architecture framework, Architecture processes, Architecture governance, Architecture value, Organization structure & skills management, and Communications and stakeholder management.

BPM	Business Process Mgmt.	Strategy & planning, BPM org and personnel, BPM standards and methods, BPM techniques, Stakeholder management & communication, Scope of implementation, Process architecture, Process governance, Process improvement, Process automation, and IT contribution.
ISM	Information Security Mgmt.	Information security strategy, Security policies' standards and controls, Security roles & responsibilities, Communication and training, Security performance reporting, Supplier security, Security architecture, IT component security, Physical environment security, Security budgeting, Tools and resources, Resource effectiveness, Security threat profiling, Risk assessment, Risk prioritisation, Risk handing, Risk monitoring, Data identification & classification, Access management, life cycle management, Business continuity planning, and Incident management.
UED	User Experience & Design	User experience assessment, Design approach, Construction of "Proof of Concept", Evaluation, and Use of feedback.
UTM	User Training Mgmt.	Training resource, Delivery mechanism, Training provision, Training delivery, and Training impact assessment.
SRP	Service Provisioning	Service definition, Service architecture, Service life cycle management, Customer-facing service operation, and Internal service execution.
SD	Solution Delivery	Requirements, Design, Implementation, Testing, Peer reviews, Release management, Change management, Methodology, and Process adaption.
SUM	Supplier Mgmt.	Supplier engagement, Supplier communications, Order management, Contract management, Supplier management, Supplier risk monitoring, and Performance measurement & monitoring.
SRC	Sourcing	Strategy alignment, Objectives & scope, Sourcing model selection, Business case creation, Organizational readiness, Re-evaluation, Provider selection, Contract preparation & closing, Transition, and Provider integration & governance.

TIM	Technical Infrastructure Mgmt.	PC management, Peripherals management, mobile device management, decentralised server management, LAN/RAS management, MAN/WAN management, Voice management, Server management, Storage management, Asset management, and Security management.
DSM	Demand, Supply Mgmt.	Demand analysis & management, Technology impact assessment, Supply analysis & management, Technology application, Gap and optimisation management, and Service portfolio management.
BP	Business Planning	Forming teams, Establishing a baseline, Requirements gathering, Plan compilation, Plan objectives, Resource usage, Success criteria, and Planning insights.
PPM	Programme & Project Mgmt.	Standards and methods, Continuous improvement, Tools and techniques, Performance & quality management, Change & risk management, Post-programme learning/project learning, Organizational structure, policies, standards and processes, Involvement of stakeholders, and Definition of people's competence requirements.

Table 5.8: DTCM Capability Building Blocks (taken from IVI, 2014).

It is worth noting that the IT-CMF, like most commercial frameworks, is continually being refined and updated to reflect the changing impact that technology is having on organizations. Because of this, some of the capability building blocks will be subject to change as the influence of technology changes within the organizational context. That said, it is interesting to note that there are common themes and aspects of capability performance that reoccur across the 19 identified capabilities. These are as follows:

1. Communications
2. Governance
3. Strategy
4. Vision
5. Collaboration
6. Performance monitoring & management
7. Risk handling/management
8. Stakeholder management

These aspects of capability performance are not dependent on technology, but on the development of core skills as identified by Feeny & Willcocks (1998): business, interpersonal, and technical skills. This gets back to what is at the core of being a digitally enabled organization; the ability to understand what is required by the business or organization, to effectively engage with workers, customers, and any other stakeholders, in order to re-think how they use technology to build competitive, innovative products and services in a way that develops competitive advantage.

Time Out

Think about it: Going Digital

Wheels and Cogs Ltd. is an online provider of bikes, parts and accessories to amateur and professional cyclists. The company was set up 15 years ago by Hans Burn, a keen amateur cyclist. Hans first opened a shop, followed two years later by a warehouse outlet that provided a whole range of services to the keen cyclist. The business went from strength to strength and although Hans opened another warehouse outlet, he was keen to keep the business small as he felt that to increase too rapidly would impact his reputation for delivering a highly personalised and friendly service.

As the years progressed, and the reputation of Wheels and Cogs Ltd. grew as being a reliable, efficient, and knowledgeable company, Hans' team started to get more and more requests from overseas to supply products. Dan Ivers, Head of Sales, was keen to take advantage of this channel opportunity. "Let's set up a website and distribution centre and start selling online". This sounded simple, what could go wrong? However, Hans was concerned because there was already a number of well-established online retailers in this space, and Wheels and Cogs would be starting out as the "new entrant". Also, "how would we maintain our reputation for friendliness, helpfulness, and knowledge, in an online environment, as these things made us different? Besides it also takes years and lots of investment to develop an effective global online business… so should we jeopardise what we have just to get online?"

Marina Sanchez, who is Head of Marketing, has a different suggestion. "Maybe we can take aspects of the business online, but in a way that means we don't have to do all the development work ourselves." Hans and Dan are intrigued…

Marina suggests that they take a look at the capabilities they currently have, and match these to the capabilities they think they would need to support an online business. Any capabilities they identify as being necessary they can develop, outsource, or strategically collaborate on.

Harry Lime, the Head of IT, thinks this is a logical and safe way to proceed. Over the past few months Harry has been looking at ways to increase the value that IT can bring to the business, and the identification of IT capabilities is certainly a step in the right direction. Hans asks Marina and Harry to head up a working group to map the current capabilities of the business, and those they think they would need for the online business, and report back in three weeks.

Questions:

- Do you think defining capabilities is necessary in order to develop an online presence?
- Do you think the DTCM could be used to identify required capabilities for an online service?
- What additional capabilities do you think would be needed to support the online business?
- How many of these capabilities would you consider as being dynamic?

5.4 Learning Summary

For many years, technology has been seen as a necessary cost to be borne by an organization. As a cost, particular focus has been given to the development and deployment of efficient processes to support the organization's operational requirements. In many respects, this need to improve the efficiency of core business processes is still very relevant.

However, recent advances in technology have changed the way that organizations view technology-based resources.

Technology is no longer simply a commodity to be used in the same way that we use electricity, water, or other utilities. With the advent of cloud technologies, a faster and more accessible internet, improved data analytics, etc., technology has the ability to become a real game-changer for organizations looking to become more competitive. However, simply having access to technology is no guarantee of success. Organizations need to consider how the technology is aligned, adopted, integrated and managed across the organization. In order to understand the impact that technology has, or potentially could have across an organization, technology should not simply be viewed in terms of its role in process optimisation, but also in terms of capability building.

This introduces the notion of **capability-centric frameworks** and **process-centric frameworks** in organizations. As organizations strive to be more competitive in an increasingly dynamic environment, maintaining a sustainable competitive position becomes harder and harder to achieve. Therefore, understanding how technology enabled/enabling resources contribute to building key capabilities becomes vitally important. However, due to finite resources organizations cannot develop all their capabilities to a high level. Therefore, they need to identify the capabilities that really drive value for the business. By doing this, a smaller set of capabilities will be identified that directly contributes to helping to build a sustainable competitive advantage. These capabilities are referred to as **Dynamic Capabilities**.

As an organization's operating environment changes, so too will its strategy. As this happens, capabilities that were previously dynamic will no longer be, and new capabilities will replace them. Organizations, therefore, need to keep track of the capabilities needed to keep the organization competitive. This is also important as capabilities may require significant time and investment or resources to develop, and as such the organization needs to make sure they are being applied to the capabilities that deliver the greatest return.

One framework that can be used to help identify technology-based capabilities is the IT-CMF. This has defined a large set of capabilities that can provide the organization with a starting point for understanding the main capabilities influencing performance. What the IT-CMF also provides

is a way of understanding the maturity of each capability. This can give the organization a better understanding of the level of investment that may be required to improve the capability to a point where it is providing real benefit to the business.

The relevance of taking a capability view has become even more important with the advent of the "digital" organization. This new way of viewing technology really shifts the focus from how technology works to how technology can better drive the organization's business value. One way that aids an understanding of the digital capability needs of an organization is through the use of the dynamic technology capability model (DTCM). This model ensures that consideration is given to how technology aligns to the organization's core strategic goals, how the technology can then be integrated into the organization's core business processes to ensure that it can continue to respond to changing market forces and customer needs, and finally, how organizations can ensure that the technology will be adopted and used effectively by all its stakeholders.

5.5 Case Study: Developing Capabilities for SMEs

In 2012 the Irish Government, recognising the important role that small to medium enterprises (SME) have in the economy, funded research into the development of a capability framework for SMEs. The intent was to identify the important capabilities that SMEs should focus on in order to maximise the benefits of technology in developing a competitive position.

At the time of its launch, the framework was called the SME IT-CMF. It has now been renamed the SME Capability Improvement Programme (SMECIP). The framework consists of ten capabilities that have been taken from the IT-CMF, and modified to better suit an SME environment. Although the IT-CMF can be applied to any size of organization it was felt that the language and scope of the capabilities would need to be modified to better suit SMEs.

The ten capabilities that make up the SMECIP are listed as follows:

Critical Capability	Purpose	Benefit of greater maturity
Business Process Management (BPM)	Document and manage the IT department's work flows and business processes.	Better management of processes and work flows in order to improve IT efficiency.
Business Planning (BP)	Define and anticipate the company's demands for IT capabilities and services.	A better ability to prioritise projects and identify key objectives and areas for IT investments.
Strategic Planning (SP)	Set the vision, mission and objectives for the IT department in line with the company's overall strategies.	Better alignment of business and IT strategy to ensure an effective translation of plans into IT capability requirements and business value.
Risk Management (RM)	Analyse risks and their potential impacts, and develop strategies to mitigate those risks.	Ensured business continuity by systematically mitigating IT operational risk.
Sourcing (SRC)	Identify and form supply agreements with vendors and internal providers.	Better management of resources through appropriate outsourcing.
Funding and Financing (FF)	Determine the scale, scope and sources of funding for IT, and assign financial resources to IT activities.	Improved balance between capital and operating expenses.
Relationship Asset Management (RAM)	Enhance the relationship between the IT department and the company's business departments.	Risks and rewards shared by IT and business departments.
Solutions Delivery (SD)	Deploy systems and solutions that efficiently address the company's IT requirements and opportunities.	Better IT solutions' delivery with the cost, schedule, functionality, and quality that the company needs.
Service Provisioning (SRP)	Provide reliable IT services to support the company's objectives and strategies.	Help desks and service solutions in position to support IT customers.
User Experience Design (UED)	Create solutions that increase both business productivity and the satisfaction of end users.	Usefulness and ease of use recognised as hallmarks of a successful IT solution.

Table 5.9: SME Capability Building Blocks (taken from IVI, 2014).

The left-hand column identifies the capabilities that make up the SMECIP. The "purpose" column provides an explanation of each capabilities' purpose, and the right-hand column gives an overview of the outputs an SME would expect to see from the capabilities. As with the IT-CMF, the SMECIP provides a five-stage maturity profile for each capability, which in turn provides the SME with an overview of what each capability should look like at each stage of maturity.

As can be seen, the capabilities that make up the SMECIP are focused on IT-related performance. This is not surprising considering the fact that the IT-CMF was a significant influence in the SMECIP's development.

Since the framework's launch in 2012, uptake has been slow, and whilst many SMEs find the idea of the framework useful, its focus on technology is seen as placing too much effort and resources on building technology-centric capabilities. So, many SME owners think that a more balanced approach between business capabilities and technology capabilities would be more appropriate.

Questions:

- Is capability development something that should just be considered for technology?
- What additional capabilities do you think should be added to this list for SMEs? List three additional capabilities.
- What are the main challenges you would see in implementing the SMECIP in an organization you are familiar with?
- How would you advise an SME to go about using the SMECIP to improve their competitive advantage?

5.6 Review Questions

True or False Questions

5.1 A good process will ensure a sustainable and competitive position. T or F?

5.2 Capability and process efficiency are not the same thing. T or F?

5.3 The IT function's main role is to support the business. T or F?

5.4 The IT function's primary role is to ensure IT costs are minimised. T or F?

5.5 Capability development is mainly concerned with process optimisation. T or F?

5.6 ITIL and COBIT are focused on developing IT capability. T or F?

5.7 Organizational restructuring is an example of an internal force. T or F?

5.8 Mature capabilities will help organizations to sense and respond to their changing environment. T or F?

5.9 Capability development must be aligned to strategic aims. T or F?

5.10 Having capabilities that are not easily copied helps to build a sustainable competitive advantage. T or F?

5.11 Technology's role in capability development is limited. T or F?

2.12 Organizations in the same industrial sector will have very similar capabilities. T or F?

5.13 Organizations in the same industrial sector will have very dynamic capabilities. T or F?

5.14 Only IT frameworks that focus on capability are important to technology enabled organizations. T or F?

5.15 Process-centric frameworks are focused on developing an ability to produce a desired, repeatable output to a predetermined quality and quantity. T or F?

5.16 Capability-centric frameworks are focused on developing the ability to effectively respond to (as yet undefined) external and internal challenges. T or F?

5.17 Capabilities are quick to develop, as they only require the acquisition of technology. T or F?

5.18 The higher the capability maturity, the more relevant is the capability to the organization. T or F?

5.19 Dynamic capabilities are those that help build competitive advantage. T or F?

5.20 Once identified, dynamic capabilities do not change for an organization. T or F?

5.21 The IT-CMF identifies 35 critical processes that help align IT to the business. T or F?

5.22 Dynamic capabilities relate to the firm's ability to proactively adapt in order to generate and exploit internal and external firm-specific competencies. T or F?

5.23 Digital capabilities only relate to technology. T or F?

5.24 Mobile internet accessible devices are an example of digital enabling technology. T or F?

5.25 "Digital" is about improving access to information that will enable timelier, and cost-effective decision-making, which in turn will build a more responsive, customer-focused organization. T or F?

Multiple Choice Questions

5.26 Which of the following would be considered an external force?

A. Available resources
B. New disruptive technologies
C. Organizational restructuring
D. Changing strategic objectives

5.27 Which of the following would not be considered a significant challenge in identifying and developing capabilities?

A. Generating trust
B. Acquiring resources
C. Optimising processes
D. Finding time

5.28 Which of the following would not be considered a capability?

A. e-commerce website
B. Technical infrastructure management
C. Online order processing
D. Strategic planning

5.29 Which of the following IT frameworks is focused on capability maturity?

A. COBIT
B. TOGAF
C. BISL
D. ITCMF

5.30 Which of the following is focused on understanding which organizational abilities can and should be developed to support and build a unique and sustainable competitive advantage?

A. Process-centric frameworks
B. Work-flow-centric frameworks
C. Competency-centric frameworks
D. Capability-centric frameworks

5.31 Capabilities help develop which of the following?

A. Competitive advantage
B. Process performance
C. Organizational responsiveness
D. Resource optimisation

5.32 Which of the following is not a capability maturity level?

A. Optimised
B. Initial
C. Improving
D. Advanced

5.33 Which of the following describes a dynamic capability?

A. Dynamic capabilities are aligned to strategic objectives
B. Dynamic capabilities will change
C. Dynamic capabilities relate to technology
D. Dynamic capabilities help to build competitive advantage

5.34 Which of the following is not one of the four capability groups of the IT-CMF?

A. Managing IT like a business
B. Managing the IT infrastructure
C. Managing the IT capability
D. Managing IT for business value

5.35 Which of the following is not a quadrant of the capability development matrix?

A. Outsource with a strategic partner
B. Develop and test
C. Develop and review
D. Outsource

5.36 Which of the following advances in technology is considered a catalyst for the “digital” organization?

A. Improved broadband speed
B. Increased in wi-fi access
C. Reduced cost of storage
D. Access to affordable mobile technologies

5.37 Which of the following goals is "digital" focused on developing?

A. Improved decision-making
B. Improved customer engagement
C. Improved organizational responsiveness
D. Improved IT asset management

5.38 Which of the following is not a component of the dynamic technology capability model?

A. Technology alignment
B. Technology management
C. Technology and business leadership
D. Technology design

5.39 Which of the following is not a common aspect of the digital capabilities as outlined in the DTCM?

A. Communications
B. Governance
C. Strategy
D. Training

5.7 Review Question Answers

True/False Answers

5.1 F, 5.2 T, 5.3 F, 5.4 F, 5.5 F, 5.6 F, 5.7 T, 5.8 T, 5.9 T
5.10 T, 5.11 F, 2.12 T, 5.13 F, 5.14 F, 5.15 T, 5.16 T
5.17 F, 5.18 F, 5.19 T, 5.20 F, 5.21 F, 5.22 T, 5.23 F
5.24 T, 5.25 T

Multiple Choice Answers

5.26 B, 5.27 C, 5.28 A, 5.29 D, 5.30 D, 5.31 A B C D
5.32 C, 5.33 A B D, 5.34 B, 5.35 C, 5.36 A B C D
5.37 D, 5.38 D, 5.39 D

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Chapter 6: IT Governance and Risk Management

Learning Objectives

On successful completion of this chapter you will be able to:

- Explain why governance is a necessary part of organizational management.
- Identify the core components of a typical governance structure.
- Describe the difference between corporate governance and IT governance.
- Identify the link between risk and governance, and the specific role IT governance plays in managing the risk.
- Describe the structure of an IT governance framework.
- Describe the challenges inherent in implementing a governance framework, and how these challenges can be overcome.
- Describe how governance is not just a method of control, but can positively influence organizational performance.
- Demonstrate how technology-based risk can be objectively assessed.

6.1 Introduction

Technology's influence in all aspects of organizational performance is increasing. As such, technology's role in all aspects of an organization's ability to plan, design, implement, and manage core processes and operations is at the heart of the modern digital business. Therefore, the effective control and management of technology-based resources and capabilities are necessary to assure business and IT alignment. With the significant costs incurred in choosing and implementing certain technologies, organizations need to be sure they fully understand the implications of their strategic and operational choices. Few organizations get to build their IT/IS infrastructures from scratch. Most find themselves building on legacy systems, with the constant challenge of

integrating off-the-shelf systems with customised, older technologies that may, or may not, be unsupported by the original manufacturer. This can make for a very challenging environment, where the need to improve technology-based capabilities is constrained by the need to maintain a high level of operational performance.

Organizations find themselves in the challenging situation where they have to keep the technology relevant and in line with the business need, whilst maintaining a high level of service through regular periods of transformational change. It is vitally important to ensure that the decisions effected by, or effecting technology are made in an informed and objective manner for the overall benefit of the organization. The individuals having the responsibility to make decisions relating to changing the technology alignment or profile of the organization must be clearly identified. Many individuals will have opinions and views as to what needs to change, and how change needs to be implemented. However, the organization must ensure decisions are handled in a structured, accountable, transparent, and informed manner. As part of the decision-making process, key individuals must also be aware of, and able to assess the potential of any risks inherent in changing the technology profile of the organization. Risk can never be fully removed from any change initiative, but through assessing different risks options can be identified to reduce the probability or their potential impact. Because of this, structures and controls need to be put in place to ensure the right people are engaged, informed, and active in making the key decisions relating to how technology is employed throughout the organization.

What this chapter will do is explain the reasons for IT governance, and how it links to the strategic purpose of the organization. The chapter will also define what the structure of a governance framework should look like, and also how to identify and assess potential risks.

6.1.1 Why the Need for Governance?

Why do we need governance? We have a CIO/IT manager or IT director – surely these should be enough? Firstly, governance is not just an IT requirement. The need for governance comes right from the top of the organization. The notion of governance is based on one main requirement:

the need for accountability. According to Johnson *et al.* (2008) governance is:

"Concerned with the structures and systems of control by which managers are held accountable to those who have a legitimate stake in an organization." (Johnson *et al.,* 2008)

This is a fairly broad definition, and not the only one. However, it encapsulates the basic essence of what governance is focused on. A more specific and detailed view of what defines IT governance will be covered in section two of this chapter. However, all forms of governance will share the same guiding requirement, which is assuring the accountability of key decision-makers to the organization's stakeholders.

The need for governance has become more pressing over recent years. As organizations and their activities become more transparent to the public, and organizations become more aware of their social responsibilities, the need to demonstrate good, sound governance is necessary if the organization's reputation is to be maintained. Examples abound where organizations have sustained significant reputational damage, which in turn has impacted revenues, and in some cases even forced them out of business. Take for example…

- **Enron**: Fraudulent accounting practices resulting in the collapse of the company in 2001.

- **GAP**: The use of low-paid labour in emerging economies to reduce manufacturing costs was seen as an un-ethical and exploitative practice, which impacted the reputation and sales of the company.

- **Lehmann Brothers**: Fraudulent accounting practices which, when uncovered, led to a mass exodus of the bank's clients. This resulted in the bank filing for bankruptcy in 2008.

- **Fannie Mae Bank**: In 2011 six senior executives from the bank were charged with securities fraud by the US SEC (Securities and Exchange Commission). This and other financial irregularities have had a significant impact on its reputation resulting in a devaluation of the share price to the point where, in 2013, the company's stocks were delisted from the NY Stock Exchange.

- **WorldCom**: In 2003 fraudulent accounting practices and inflated revenues contributed, to the point where assets had been overstated by about $11 billion USDs. The SEC investigated and fined WorldCom nearly $3 billion USDs for the error.

In the case of WorldCom, the remedial action to restore credibility and trust in the organization was to install senior management from the SEC to oversee the implementation of a governance system.

These are high-profile examples of organizations that are well known. However, these issues can still manifest in any organization where there is little or no accountability. Johnson *et al.* (2008) identify three main reasons for the implementation of a governance system. These are:

- **The separation of ownership and management control**: This means the organization operates within a hierarchy of governance. The hierarchy ensures the representation of all stakeholder groups and the chain of accountability is clearly defined and understood.

- **Corporate scandals**: Recent, high profile scandals have caused some concern over how certain stakeholder groups interact; in particular, how the shareholders interact with the board of directors, and how the board of directors can be held accountable for their business decisions.

- **Increased accountability to wider stakeholder interests**: This relates to the growing concern that organizations must be more transparent in their decision-making. They must also be more accountable not just to the shareholders, but also to the wider community of stakeholders, especially concerning social issues.

Certainly, stakeholders expect organizations to be more socially aware and to practise good corporate citizenship in how they create value for their owners/shareholders.

6.1.2 The Corporate Governance Chain

One way of defining who should be part of an organization's governance framework is, quite simply, to develop a **governance chain** by identifying all of the key stakeholder groups that have an interest in the

performance of the organization. The chain should start with management and work upwards to include every interest group up to, and including, the shareholders.

Figure 6.1 shows what a governance chain would look like. Between each stakeholder group the chain identifies the type of reporting that will take place. At the executive director level, the chain encompasses each directorate, or core business function across the organization. In Figure 6.1, for clarity, only three directorates have been included (CFO, COO, CIO), but in reality, organizations could have many more, such as a director of sales, HR, manufacturing, marketing, etc.

According to Johnson *et al.* (2008), the relationship between each of the stakeholder groups can be defined in terms of the "**Principal-Agent Model"**, commonly referred to as the "**Theory of Agency**". In the "theory of agency" the "agent" is anyone authorised to act on behalf of a principal. Looking at the governance chain in Figure 6.1, the trustees of funds are the agents of the beneficiaries. This means that the trustees need to work on behalf of the beneficiaries. As agents of the trustees, the investment managers must also work in a way that puts the trustees' best interests first. This principal-agent relationship continues on down through the chain to the managers, and from there to the non-management staff.

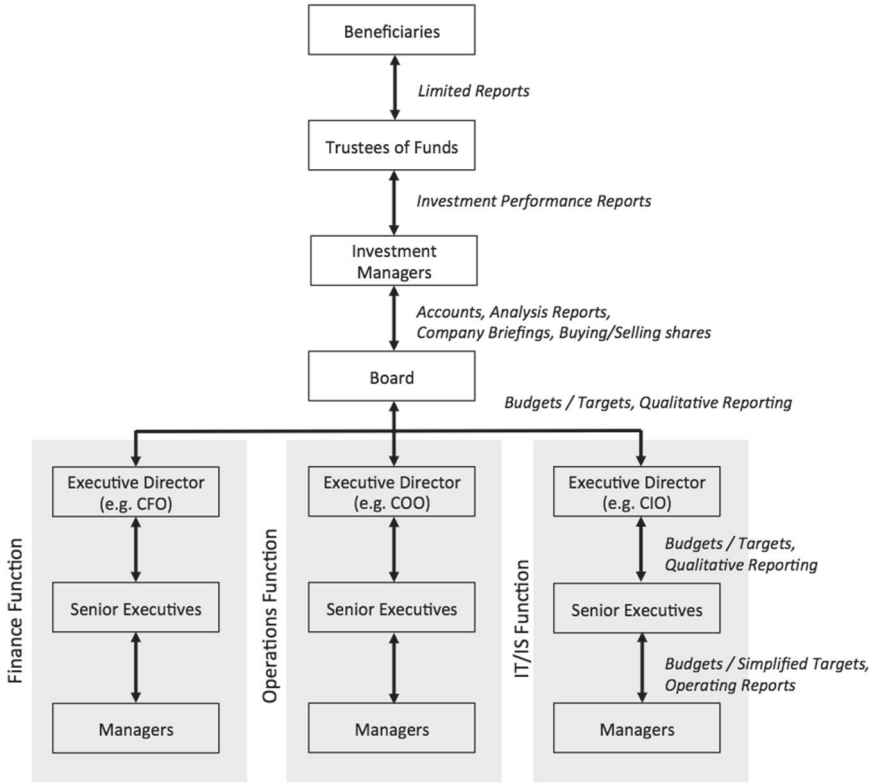


Figure 6.1: Corporate Governance Chain (adapted from Johnson *et al.,* 2008)

Unfortunately, the principal-agent relation is not without its problems. Sometimes the actions of the agent may not be fully aligned to the best interests of the principal. When this deviation happens, it is referred to as an **Agency Cost** (Jensen *et al.,* 1976).

Agency costs can be incurred under the following circumstances:

- **Asymmetric Information**: This may happen when the agent has more information that the principal. In effect a failure of information flowing up the chain. Therefore, the principal may not receive the necessary information to validate the agent's actions, or fully understand the

relevance of the agent. The agent may believe they are working in the best interests of the principal, but may be making decisions whose full implications are not understood by the principals above them. An example of this might occur when senior management decide to outsource certain activities to a third party, who, in turn maybe involved in certain business activities not sanctioned by the Trustees of funds, such as nuclear power, defence contracting, or operating low-cost manufacturing in developing regions. This third-party supplier might be engaged at a local level without informing the principal of such a decision.

- **Misalignment of Incentive and Control**: This may occur when the expectations of the principal are not properly passed on, or understood by the agent. In effect, this is a failure of information flowing down the chain. In this case, the agent may feel they are working in the best interests of the principal, however, the requirements of the principal have been misunderstood, or misinterpreted. Once again, the intentions of the agent are still to deliver value for the principal. An example of how this might manifest is if the agent makes the decision to hire a third-party supplier not knowing that the trustees have an ethical partner policy that prohibits engaging with any other business involved in a pre-defined set of activities.

- **Self-interest**: This form of agency cost is different to the previous two as this is not down to communications issues, but the explicit need of the agent to put their interests above those of their principal. This may simply be down to the agent's belief that the principal's requirements will be costly to the agent. An example of this is when a house-buyer (principal) goes to an estate agent (agent) to buy a house. The principal expects the agent to get the best possible deal in terms of a low house price. However, the agent is focused on maximising their commission, which is based on a high house price.

The existence of any of these agency costs may result in the wrong decisions being taken, which in turn, may not be in the best interests of the organization's principal. By understanding which stakeholders make up the governance chain the organization can start to build an effective relationship map which identifies the principals and agents. The manner in which information flows up and down the chain is also vitally important. If misunderstandings occur, then the implications of decisions may not be fully understood. Finally, the governance structure must take into

consideration various mechanisms to reduce the impact of "self-interest". These could include performance-related pay, profit sharing, regular performance reviews, and contract termination.

6.1.3 Understanding the Risks Associated with Technology

The fast-moving and constantly-changing environment is causing many organizations to re-evaluate their own posture concerning technology adoption and the opportunities and risks this now brings to their respective operating environments.

However, for many organizations the various IT risks are often under-assessed. As technology continues to drive industrial transformation, technology enabled models are gradually replacing traditional business models, and while this may support improved operational efficiency, it also exposes an organization to the likelihood of increased risks and impact levels. Today, with the proliferation of mobile computing, social networking, and cloud-based services, organizations face an increased risk of data leakage, asset theft and reputational damage (Chapter 11: Securing your Information in a World of Open Access). Being able to effectively manage the various IT risks is an important capability for organizations looking to maximise the value associated with their IT investments. Therefore, effective practices should consider *all* key IT risk areas in order to enable CIOs and CEOs to prioritise their resources in addressing the most significant risks.

Some of the most obvious risks now facing organizations include – but are not limited to – changing parameters around IT security, data protection and information privacy, business continuity and disaster recovery, IT investment and project delivery, service contracts and suppliers, and threats to business image and brand reputation. Within this fast-moving business environment, organizations cannot afford to stand still in terms of risk evaluation. Organizations that are serious about risk management must develop a capability to assess, monitor and manage the exposure to, and potential impact of, IT-related risks.

This serves to highlight the relationship between risk management and governance. Effective risk management will help to identify and assess the potential impact of different scenarios for change. Good, effective governance will then ensure the right decision is made for the right reasons. As George Bernard Shaw once said:

"The moment we want to believe something, we suddenly see all the arguments for it, and become blind to the arguments against it."

Managing risk should help to objectively assess the different options available, and governance will help ensure that the decisions for and against different options are weighed up fairly and equitably.

The pace of technology-driven change has highlighted the need for effective governance. Implementing new technologies such as ERP, CRM, data analytics, virtualisation, or cloud-based systems can be costly and potentially impact operational performance if not implemented correctly. If such an enterprise-wide initiative fails, the cost could seriously impact the organization's ability to remain viable. When dealing with such critical systems, or indeed, with technology-based products and services, organizations need to ensure that risks associated with the technology are understand and being managed in an accountable and transparent manner. Stakeholders at all levels do not want to find out that what is finally delivered is not what was agreed. There are many examples where organizations have wasted substantial amounts of money on technology-driven projects. Take for example, the **Ford Motor Company**, who in 2004 abandoned its Oracle-based online procurement system known as Everest, in favour of legacy technologies it had used before. Ford invested approximately $400 million USDs in the procurement system over a period of four years. Ford is not alone in making this type of mistake, and luckily it was sufficiently financially stable to carry this cost of failure. However, this is a level of failure many organizations could never walk away from. The reality is that risks impacting an organization's technology infrastructure also impact the organization's ability to perform and conduct its business.

Time Out

Think about it: Implementing an ERP System

Mitre Manufacturing Ltd. (MML) is Europe's largest manufacturer of skis. The business has been in existence since 1972 and now accounts for over 60% of all skis sold in the European market, and 45% of all skis sold in the North American market. The business had been growing steadily over the last five quarters after being relatively static for three years.

MML has two manufacturing sites located in Switzerland (Bern and Interlaken) and one in Canada (Calgary). All three sites have developed their own processes and systems to manage stock, suppliers, and logistics. Now that demand for MML products is increasing, and competition from companies in low-cost economies is beginning to make an impact in the market, MML's CIO, Dieter Muller, wants to implement a new enterprise resource planning (ERP) system across all three manufacturing sites. Dieter believes that such a system will help standardise processes, and allow for improved cost optimisation across all three sites. The idea sounds reasonable and the senior management team (SMT) has been informed of Dieter's plan, but no decision has yet been made as to whether the SMT will approve the plan.

Hans Snyder has been the CEO for the last 15 years and was responsible for taking MML from a small family-run company to the publicly listed international company it now is. Hans is aware of his influence within the organization, and likes to take charge of decision-making if he thinks the SMT members are taking too long to make up their minds. Hans has a motto that is "it's better to do something and ask for forgiveness after, than waste time waiting for permission, and miss the opportunity". This motto has seen MML successfully break into the North American market under Hans' firm direction.

Dieter and Hans play golf every weekend, and Dieter sees this as the perfect opportunity to by-pass the SMT and to get Hans to endorse what he believes is obviously the right thing to do. If Hans agrees to the implementation of the ERP system then Dieter knows he can get the system implemented in just six months, based on the experiences of a

Swiss watch manufacturing company with manufacturing sites in the US and Japan.

Hans likes the idea of taking cost out of the manufacturing process, and also gaining more insight into how each of the manufacturing sites is being managed. Hans believes that this new ERP system will give him the data and information necessary to drive real improvement in this part of the business.

Jan Koppel is Chief Operations Officer (COO) and responsible for manufacturing operations across all three sites, as well as logistics and the distribution of products into the different channels to market. Jan is aware that Dieter is keen to implement an ERP system but no conversations have taken place to discuss details. Because of this, Jan, like the rest of the SMT, thinks the idea is still in its conceptual stage and needs to be discussed and tested before being approved.

Hans, however, is conscious of the growing threat of competition from low-cost economies and feels they need to act now or risk losing market share. Hans after all is the CEO – he is paid to make tough decisions. The question is, should this be one of those decisions?

Questions:

- If the CIO and CEO at MML know that the ERP system will improve costs and efficiencies within the manufacturing process, why shouldn't they go ahead and implement it straight away? What else needs to be considered?
- Should the implementation of such a fundamentally important system be left solely to the IT function to implement? Even if the CIO has the organization's best interests at heart?
- Without doubt, Hans and Dieter have the company's best interests at heart, but have they considered the impact to the business if the implementation should fail? What could possibly go wrong?
- Dieter is basing the implementation of the ERP system on the experiences of another manufacturing organization. Is Dieter wise to do this, and can he be sure of making a reasonable estimation of the time needed to implement the system?

6.2 IT Governance

A fundamental question for every organization is…**does the IT capability improve organizational competitiveness or performance?** Organizations need technology to support core business processes, but who is responsible for managing technology-based resources? Should this responsibility be left entirely to the IT function?

Organizations need to be responsive and flexible in dealing with changing market demand and environmental factors. However, information systems, once implemented, tend to be relatively rigid. Technology can take a significant amount of time to implement, which may result in the technology's intended use becoming misaligned to the changing organizational needs. Many organizations are able to continue operating with this consistent misalignment due to a degree of flexibility with their people and systems, and relative stability in the market. This in turn has allowed many senior managers to abdicate their responsibility to over-see IT performance, and defer this responsibility wholly to the IT function. However, times are changing, markets are demanding more responsiveness from businesses, which in turn requires better alignment between technology and business. As such, technology is now playing a more active role in building competitive advantage through process optimisation, cost management, and even product and service innovation. This tighter linkage between technology and business model performance means that the IT function cannot be left to govern how technology is assessed, invested in, implemented, and reviewed in terms of its business value to the organization as a whole.

It is hard to imagine that the influence of technology will wane in the future. Irrespective of the aims and objectives of an organization, technology has become an integral part of any plan for building competitive advantage or even just increasing performance. Therefore, how technology is used and controlled across the organization needs to be governed. Ross and Weill (2005) define IT governance as:

"Specifying the decision rights and accountability framework to encourage desirable behaviour in the use of IT."

(Ross & Weill, 2005)

However, the IT Governance Institute (www.itgi.org) focuses on aspects of leadership and strategic alignment as being central to the definition of IT governance.

IT governance ***"…is the responsibility of the board of directors and executive management. It is an integral part of the enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives***."

(IT Governance Institute)

Both descriptions are valid with Ross and Weill (2005) providing a much broader definition then the IT Governance Institute. According to Weill and Ross (2004), organizations that implement good governance practices around their technology can see an improved return on their IT investments of up to 40% more than their competitors. The focus on governance shifts the perspective of those involved in design, implementation and performance from technical performance to business value. This is simply down to the fact that if you leave the control and management of any aspect of performance to a single group (in this case the IT function) the focus will be narrow and specific to the needs and understanding of that group. If, however, control is handed to a group made up of interests from across the organization (finance, marketing, manufacturing, research, HR, etc.) the focus will expand to consider the wider impact on the organization.

As Weill and Ross (2004) point out, organizations focused on driving business value from their IT capabilities and resources do so in a variety of ways, which include:

- Proactively and explicitly clarifying business strategies and the expected role that IT will play in achieving them.
- Measuring and managing the amount spent on, and the value received from, IT.
- Assigning accountability for the organizational changes required in order to benefit from new IT capabilities.
- Learning from each implementation, becoming more adept at sharing and reusing IT assets.

In effect, Weill and Ross (2004) found that organizations that succeeded in aligning their technology to their business, did so with the support of an

effective IT governance framework. This in turn resulted in improved organizational performance.

Because of the direct link between IT governance and governance in general, and organizational performance, governance is not just important for the internal management structure of the organization. External investors (venture capitalists, financial management, banking institutes) rate an organization's governance metrics on a par with the organization's financial indicators. In fact, organizations that can demonstrate sound governance structures can expect to see an increase in their market valuation.

However, the increased focus on IT and corporate governance is also being driven by the need for organizations to comply with regulatory compliance such as **Sarbanes-Oxley** in the US, and **King III** in South Africa. Most publicly listed organizations trading internationally will now have a requirement for regulatory compliance.

6.2.1 Defining an IT Governance Framework

IT governance, in effect, is not so much about the actual management of technology, but more about the effective alignment of technology to the business, ensuring that all parts of the organization are involved in the conversation concerning IT investment, how risk can be mitigated around IT investment (more on risk in the next section), and what constitutes a good return on IT investment.

One commonly adopted framework for IT governance has been developed as part of the **CoBIT** framework (Control Objectives for Information and related Technology). This framework was developed by the Information Systems Audit and Control Association (ISACA) in 1996, and is designed to "provide guidance for executive management to govern IT within the enterprise" (www.isaca.org).

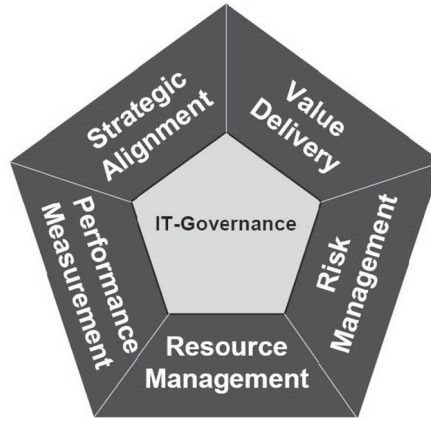


Figure 6.2: CoBIT IT Governance Framework (www.isaca.org)

The CoBIT framework in Figure 6.2 identifies four key elements of IT governance (Chaffey & White, 2011). These are as follows:

- **Strategic Alignment**: This is focused on ensuring that business and IT strategies are aligned.

- **Value Delivery**: This is focused on ensuring that technology delivers against the expected benefits.

- **Resource Management**: This is focused on ensuring that the right level of IT resource is available and applied where needed around the organization.

- **Risk Management**: This is focused on ensuring that risks are properly assessed and understood at all management levels throughout the organization.

- **Performance Management**: This is focused on tracking and monitoring strategy implementation, project completion, resource usage, process performance, and service delivery.

As Chaffey & White (2011) point out, these factors emphasise the need for IS strategy to support and be aligned with organizational strategy (refer to

Chapter 2: IS Strategy and Business Strategy Alignment). In effect, the CoBIT framework is designed to:

- Support and enable better business and IS/IT strategy alignment.
- Use technology to enable the business and maximise benefits.
- Ensure technology-based resources are used responsibly and effectively.
- Ensure technology-based risks are identified and managed appropriately.

Whilst frameworks such as CoBIT can be used to compare activities against defined standards, there is a potential problem in IT operations if the relevance of each standard is not continually assessed. If standards are allowed to become less relevant to the organization due to a change in objectives, strategic direction, or the competitive environment, the IT governance standards may become outdated. This can result in an increased level of restrictive inflexibility creeping in across core business processes. Other business functions across the organization may then start to view the current standards as being bureaucratic and out of touch with what's actually happening. This in turn may result in the emergence of "local work-arounds" and "fixes" to help individuals and groups circumvent what are increasingly being seen as restrictive and unhelpful practices, but ultimately undermine the governance process overall.

6.2.2 Implementing an IT Governance Framework

The development and implementation of an effective IT governance framework is not done in isolation. For any IT governance framework to work, stakeholders from across the organization need to be identified to engage with it. This will mean differing views and perspectives from across the organization will be brought to bear on such questions as:

- What is the role of IT?
- How is IT value defined?
- Who says when IT value has been realised?
- Who should make the investment decisions?
- Who is responsible for the effective management and control of IT resources?

These are only some of the possible questions to be asked, but it is not difficult to see where opinion will vary in terms of the potential answers, based on who's being asked the question. Therefore, the development of an IT governance framework will involve negotiation, debate, constructive discussion, compromise, a willingness to listen and learn, and often a degree of frustration. The desire to dis-engage and leave the process of managing IT/IS to the IT/IS function may be strong for many. This is the way the IT governance process must be driven at a senior management level.

The implementation of a successful IT governance framework happens through a set of governance mechanisms (Weill & Ross, 2004).

- **Decision-making structures**: The organizational units and roles responsible for making IT decisions, such as committees, executive teams, and business/IT relationship managers are identified and in place.

- **Alignment processes**: Formal processes for ensuring that daily behaviours are consistent with IT/IS policies and provide feedback on decisions. These include the IT investment proposal and evaluation processes, architecture exception processes, service-level agreements, chargeback, and metrics.

- **Communication approaches**: Announcements, advocates, channels, and educational efforts that disseminate IT governance principles and policies and outcomes of IT decision-making processes.

The practices and approaches used within each of these three mechanisms will depend on the organization. Is there a culture of compliance? Has the senior management team bought in to the idea of governance, and does it support the need for governance? How are the IT/IS resources currently controlled, and how will a governance framework affect the power balance around the organization? The implementation of a governance system, where one has not previously existed, may be met with some resistance across the organization. Therefore, like any significant change initiative, the implementation must be managed proactively with a clear edict from the senior management team that this framework will be implemented. If there is a feeling that there is no real support for the IT governance framework then it will fail.

Weill & Ross (2004) have identified some of the ways in which organizations help to support implementation through decision-making, alignment of process, and communications. Through an assessment of 256 organizations across twenty-three countries they have identified a number of ways in which an organization can help improve the embedding of a governance structure (Table 6.1).

High-level Mechanism	Common Governance Mechanism	CIO Ranked Effectiveness (1 = ineffective to 5 = highly effective)
Decision-making Structures	Executive or senior management committee	3.5
	IT leadership committee with IT executives	3.8
	Business process teams with IT members	3.4
	Business/IT relationship manager	3.9
	IT council with business & IT executives	3.7
	Architecture committee	3.1
	Capital spend/project approval committee	3.1
Alignment Processes	Tracking of IT projects and resources	3.4
	Service level agreements	3.2
	Formal tracking of IT business value metrics	2.9
	Chargeback arrangements	2.8
Communications Approach	Work with managers who don't follow the rules	3.2
	Senior management announcements	2.9
	Establish an office of CIO or Office of IT governance	3.6
	Web-based portals and intranets for IT	2.9

Table 6.1: Common Governance Mechanisms (Weill & Ross, 2004)

It can be seen from Table 6.1 that the most effective interventions in terms of establishing an IT governance framework have been those actions that bring stakeholders together from both the technical and business sides of the organization. Executive engagement is also seen as being effective in getting engagement commitments from different parts of the organization. To ensure governance doesn't slip down the priority list especially during times of change or busy operational periods, some organizations establish a CIO office or IT governance office to oversee the operational aspects of managing the framework.

Organizations such as DBS Bank in Germany, or ING, the Dutch financial conglomerate, ensure there is senior management representation on their IT governance steering groups. By having senior managers, and even executive board members play an active role in IT governance, organizations can ensure that technology is being used to fully support its strategic objectives whilst at the same time ensuring that the senior management team is fully apprised of the performance and business value that technology is delivering for the organization as a whole.

6.2.3 Linking Strategy, IT Governance, and Performance

Technology can certainly enhance an organization's ability to survive and compete in the highly competitive global market places of the 21st century. However, the success of implementation is very much dependent on the existence of good IT governance. Where IT governance is weak or non-existent the results connected with technology investment and implementation can be disastrous, and in many cases may result in the organization going out of business. The costs of many technology investments can be significant, and a failure to implement the project effectively can result in a large financial write-off for the organization.

Situations like this can happen when there is a misalignment between IT and corporate governance. Technology investments and decisions are not being made with a full understanding of their impact in terms of business value. Considering the lead time associated with IT projects and the speed of change that organizations are experiencing within their competitive market places, it is very important that IT investments are continually assessed for their continued relevance to the organization's strategic

direction. It is worth bearing in mind that good IT governance is focused on:

- Minimising investment risk.
- Minimising failure of service.
- Ensuring compliance (policy and regulatory).

There are many examples of organizations that have failed to effectively govern their IT resources. The effects have ranged from profit warnings, to fines for legal non-compliance, to bankruptcy. Some of the more notable organizations that have been impacted through weak IT governance are:

- **Borders Bookshops:** (2011) The failure to align technology to support physical channels. Leading to bankruptcy.

- **Kodak:** (2013) Although Kodak invented the digital camera, they failed to modify their business model to take advantage of this new technology. Leading to bankruptcy.

- **Blockbuster Video Entertainment**: (2010) The DVD retail organization failed to realise the benefit of digital download. Leading to bankruptcy.

- **Ford Motor Company**: (2004) It invested $400 million US dollars in a purchasing system only to abandon it shortly after. Resulting in a significant financial loss.

- **US Government**: (2004) It invested $14 million US dollars in a case file system for the FBI only to scrap the system shortly after its launch. Resulting is a significant financial loss.

- **Royal Bank of Scotland** (RBS): (2012) The bank reported significant IT problems that resulted is nearly 17 million customers not having access to their finances for days at a time. Resulting in a loss of earnings and a significant negative impact on reputation.

Good IT governance is dependent on effective alignment between the IT/IS strategy and the corporate strategy. The key term here is alignment. In the case of Kodak and Xerox, both organizations were at the cutting edge of technology (the digital camera and user interface design, respectively). What went wrong was that both organizations failed to realise the impact

that this technology would have on the market. Although these problems are not due to the lack of an IT governance structure, the question is how well did these companies assess the business value of the research underpinning these projects? Therefore, when evaluating technological investment, the organization must consider the business value that the investment will generate now, and as best as possible, in the future.

If the IT/IS investment is not delivering business value then the organization needs to consider its IT governance practices. For example, who makes the decisions and how are the decision-makers made accountable? It is not uncommon practice for organizations faced with a poor performing IT/IS to outsource the IT function and/or fire the CIO. As Weill & Ross (2004) point out, these actions do not address the underlying problem of poorly designed governance that is also not well supported by business leadership.

The link between IT governance and the business strategy must be effective at both a strategic and operational level (refer to Chapter 2: IS and Business Strategy Alignment). Huang *et al.* (2010) make the point that a well-designed and effective governance structure must deliver IT-related decisions, assets and actions that are tightly aligned with the organization's strategic and tactical intent. Wu *et al.* (2015) propose a model to highlight the relationship between governance, strategy and performance. Figure 6.3 provides a visual representation of their model.

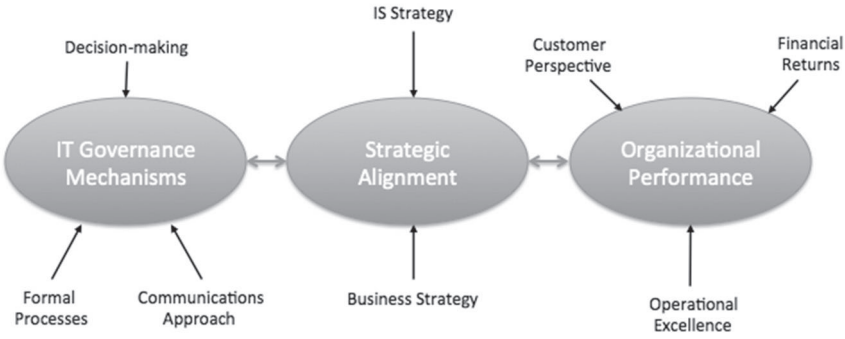


Figure 6.3: Linking Governance, Strategy and Performance (modified from Wu *et al.,* 2015)

The model highlights the influence that IT governance mechanisms have on strategic alignment, and the influence that strategic alignment has on organizational performance. It is important to realise that this influence is bi-directional. Organizational performance levels will influence strategic thinking, especially in terms of emergent strategic development (Chapter 4: Building a Digital Business Strategy). Organizations need to be in tune with their market and, therefore, must be able to adjust their strategy and strategic objectives should the market demand it. This also means ensuring that IS and business strategies are regularly reviewed and updated accordingly. Any changes in the strategy must also be reflected in the IT investment and prioritisation choices being made through the governance process.

Many IT projects will develop significant momentum as they go through the design and development process. It is, therefore, very important that should the strategic direction or priority of the organization change, there is a mechanism to review and if necessary, stop any further development. This can be traumatic for many employees due to the level of commitment and personal energy they may have invested in the project. However, consideration must be given to what the organization needs to do to continue to meet changing or new objectives. This is where an effective IT governance framework can add significant value in terms of IT/IS and business alignment.

Time Out

Think about it: Speed versus Control

Zoom Engines Ltd. (ZEL) is a high-performance engine manufacturer based in Toronto, Canada. Ted Ronson, the current CEO, established the company in 1982. ZEL manufactures car engines for rally cars, and provides engines to five of the top ten World Rally Championship teams. This is a very profitable part of the business, but not the most profitable. ZEL makes the most of its revenue from engine research, and licensing technology to many of the main car manufacturers, such as Ford, GM, Honda, and Toyota.

When the company started Ted had six employees and he has managed to grow the company to over 550 employees. The organizational structure is

very flat with only three levels of management between the most junior operator on the shop floor and the CEO. Ted is very proud of his company, and although the company has grown and become more complex in its operation, he is very keen to be a part of most of the decisions within the organization. Most members of the management team are engineers with the exception of Jan Hoogstrad (CFO) and Toby Mallak (CIO). Engine design and build quality are the absolute priority to Ted and the management team. As Ted likes to remind everyone "…we are only as good as our last engine".

As the manufacturing process is not high-volume, a lot of the engines are hand built. There are systems for stock and parts management, and for tracking design and build progress, but by and large the technology employed by ZEL is mainly to support core processes. Because of this Toby makes most of the decisions concerning technology adoption and deployment. If Toby has any concerns, he'll discuss them directly with Ted as and when he sees him around the office.

Toby was recently at a conference in Quebec on Knowledge and Innovation Management. The conference was very informative and got Toby thinking about his role as an enabler for innovation within ZEL. Toby realised that ZEL didn't really have a knowledge management system (KMS) to capture and share the learning points acquired through the research and development processes associated with engine design. Toby has come up with a plan to develop a KMS that will improve the design and build process through digital workflow management. The system will also look to replace the existing legacy systems and replace them with a cloud storage system. Toby reckons the whole system should take about 12-18 months to build, test and deploy.

Meanwhile, Ted and the rest of the management team are seeing an increase in the number of requests for research and the number of custom-built engines. This is where Ted likes to focus his energies, and because of this he generally leaves IT issues to the CIO. Toby is planning to run his idea by Ted next Wednesday afternoon. He has a slot in Ted's diary for 30 minutes and believes he can get Ted's buy-in and approval for the KMS then. Toby knows this is how Ted likes to make decisions, and Toby is confident he can deliver a KMS in the timeframe envisaged.

Jan Hoogstrad (CFO) has heard about Toby's plan for a KMS and has some concerns over the cost and value of the system. However, as IT decisions are usually left to Toby to deal with Jan can't help thinking that maybe he should keep his nose out of Toby's business and let him get on with it; after all ,Toby is very competent technically, and with the increase in orders everyone is busy enough with their own jobs. Also, if Ted is fine with the plan, then shouldn't he be fine with it as well?

Questions:

- Do you think ZEL has an effective IT governance system?
- Toby has the best interests of ZEL at heart, but do you think the plan is in line with the business objectives of the organization?
- What possible risks could be associated with the KMS project, and do you think ZEL have given/will give the correct level of consideration to them?
- Who do you think should be involved in the decision to support the development of a KMS? Should it just be left to Ted and Toby?
- Does the KMS project need to consider the increased operational demands being placed on the organization through increased orders and requests for research?

6.3 Managing Risk

Assessing risk for any aspect of organizational strategy or operational decision-making requires an ability to assess the levels of uncertainty and probability of failure, and the potential benefits, in terms of the business value that a decision will result in. The term "risk" is usually associated with a negative outcome – risk of failure, financial risk, risk to reputation, etc. However, according to Coleman (2011), managing risk is as much about exploiting opportunities for gain as it is about avoiding failure. In effect, risk management should provide the organization with an objective method for assessing the potential outcome of any business decision. Humans are very good at implicitly assessing risk – we do it every day. Should I cross the road now or wait for the green light? Will I take the last bus home, or get a taxi? Will I eat another pizza tonight, or go for a healthier option? We constantly assess the "pros and cons" of our decisions.

Some risks we can assess very well, and some not so well. What determines our ability to reduce the probability of making a wrong decision is down to a number of factors, such as prior experience of the environment, experience gained from previous decisions, and the ability to compensate for any adverse effects experienced. This approach is all well and good when planning a holiday and deciding if you need travel insurance, or deciding if you can make it home without refilling your car's petrol tank. However, when dealing with decisions that can seriously impact the operational performance of an organization a more structured and accountable approach is needed.

Access to information and knowledge can often be incomplete, and, therefore, an incomplete assessment of the risk and potential outcomes may be all that is available to the decision-maker. Unfortunately, this is more common than not. Colman (2011) believes that

"…the art of risk management is not just in responding to anticipated events but in building a culture and organization that can respond quickly to risks and withstand unanticipated events."

(Colman, 2011)

In order to achieve this, an organization needs to establish a risk management capability that exists at all levels throughout the organization. According to Chaffey & White (2011), the key generic stages in a risk management process are as follows:

- **Identify risk:** This includes assessing the probability of failure and success. This can be visualised in a matrix as in Figure 6.4.
- **Identify options**: What can the organization do to mitigate any of the identified risks?
- **Implement option**: This should focus on targeting the option offering the highest impact and most likely risks.
- **Monitor/Learn**: Monitor the progress and learn from the decisions made.

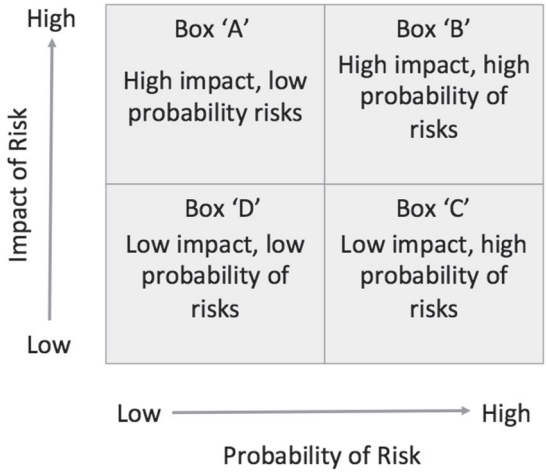


Figure 6.4: Risk Matrix (Chaffey & White, 2011)

Once the risks have been identified and the options defined, they can be placed in the matrix (Figure 6.4). Options that fall into Box "D" are the most desirable ones as they have the lowest probability of happening, and if they do, then they will inflict the lowest level of disruption. Therefore, when developing a plan to manage potential risks, the risks falling into Box "B" must assume the highest priority. Box "B" risks have the highest chance of happening, and can potentially do the most damage to the organization.

The ability to effectively identify and manage risk will not only help the organization to mitigate against unanticipated effects, but will build confidence in the organization's ability to take advantage of opportunities that promise significant business value.

6.3.1 Risks Associated with Technology

Technology-based projects are very similar to any other business-related projects in terms of the types of risks that may manifest. In many organizations today, most strategic projects designed to deliver business value have a large technology component to them. Therefore, the process of assessing risk associated with a technology-dependent project, such as a

sales automation system or a logistics management system, should be no different to that of assessing risk for any other strategic project.

However, technology does bring with it some specific risk areas that are worth considering when planning a technology-dependent change.

- **Impact of new technology**: How will end users interact with the technology? Will it be in the way expected, or will end users develop a different way of using the technology? For example, the Apple iPhone and iPad facilitated the growth in app development from not just commercial software companies but also individual developers.

- **Development timeframe:** Large complex technology projects may have development timelines that can make the organization less flexible and responsive to the demands of a dynamic market. For example, when the Ford Motor Company disengaged from its SAP deployment it was because the system failed to give the company the flexibility it needed to respond to changing customer demand.

- **Information access:** Who has access to the information being managed by the technology? Is the information flowing to the right people across the organization? Is the information informing the right level of decision-making? For example, how will a new enterprise system report performance metrics to the different levels of management? Will the information be accessible, or even comprehensible enough for effective decisions to be made?

- **Information security:** Is the organization's information secure? Do people, who should not have access, have access? Does the new technology create any new opportunities for external unwanted access to sensitive information? How will the new technology improve resistance to cyber-attacks?

- **Data protection:** How will the new technology comply with data protection policy and legislation? Where will the organization's information be physically stored? For example, there are concerns over where Facebook is storing European user data. This is now a legal issue, as European users have different rights over the way their data are handled if stored in the US versus the EU.
- **System compatibility:** How will the new technology work with existing legacy systems? Will the new technology be backward

compatible (work with older technology), and what additional remedial action will be needed to ensure compatibility? For example, how will a new cloud storage system communicate with the existing legacy storage systems?

These risks are just some of the main risks associated with technology-dependent projects. There will be others, such as end-user buy-in, user competence, stakeholder resistance to change, etc., but these are risks that can be applied to any change, irrespective of whether the change relates specifically to technology or not.

The UK Office of Government Commerce (www.ogc.gov.uk) has identified five typical causes of failure for IS projects. In effect, these five causes of failure can be applied to any of the risks identified already. The five causes of failure are identified as follows:

Design and definition failures

- The required outputs are not described with sufficient clarity.
- Over-ambitious – sweeping all the good ideas into one big project.
- The project is seen as an IT project, and not a business project.
- The end-goal is too far away, with too few review points.

Decision-making failures

- Prime responsibilities rest with committees.
- Consensus must be reached on all issues.
- No single individual is in authority.

Project discipline failures

- Project documentation replaces project management.
- Milestones are too distant and slippage is not managed.
- Requirement changes are not reflected in deadlines.
- Contingency planning is weak or unrealistic.
- The project is beyond the experience or capability of the core team.

Supplier management failures

- The project has little understanding of the supplier's commercial imperatives (SLAs).
- The supplier is not selected on a basis of value for money.
- Projects are launched without an agreed contractual start/end date, cost limit, or acceptance criteria.

- There is insufficient transparency of management information between the client and supplier.
- Suppliers are managed to limit cost rather than risk.

People failures

- There is a disconnect between the project and those who own the need.
- The culture in the project team is to explain away real risk.
- The needs of users are not understood due to secrecy or haste during the definition and design phase.
- There are too few senior people with real authority.

These causes of failure can be found in any change environment, but according to the UK government these failure causes are very common in IS-related projects. Understanding the nature of the risks associated with technology-driven change is one thing; effective management is quite another. Allowing any of these causes of failure to manifest will increase the probability of project failure.

6.3.2 Technology Risk in Context

For its effective management, it is crucial that managers understand risk. This means understanding the risks associated with the business – which also means understanding the risks associated with the products and services being offered by the organization. Irrespective of the technology being considered, and its role within the organization, efforts must be made to assess and understand the potential impact that the technology will have on the organization's ability to remain competitive. Failure to manage some of the more obvious risks, according to Sutton (2014), can result in any of the following:

- Financial loss, including loss of business or intellectual property.
- Legal and regulatory penalties.
- Reputational damage.
- Reduced operational performance.
- Harm to employees or the public-at-large.

All of these risks can directly or indirectly result in financial loss for the organization. Therefore, irrespective of the type of change being considered

by the organization, risk must also be considered in terms of its impact on the organization's financial performance. This means that the organization should not just consider technology-centric risk, but also risks associated with the organization's performance and ongoing viability.

Once a risk has been identified there are four basic actions that an organization can take. These are:

Action	Description	Example
Avoid:	If the risk is too great then the option to pursue any course of action resulting in that risk is avoided.	Restrictive penalties in a project contract may make the chances of delivery on time remote, and expensive, e.g. Fujitsu and Accenture pulled out of a £12 million IT project for the National Health Service due to governance issues.
Control:	If it is not an option to avoid the risk, then the organization will look for ways to manage and mitigate the effects of the risk.	Change may be required to comply with regulatory compliance around data protection issues, e.g. changes applied to Microsoft's Internet Explorer web browser to comply with fair competition legislation in the EU.
Accept:	If the probability and impact of the risks are low the organization may decide to accept the effect of the risk should it manifest.	Launch of a new tech product may have an impact on an existing product. However, the plan is to phase out the older product anyway, e.g. the impact of launch sales of iPhone 6 on sales of iPhone 5.
Transfer:	The organization may outsource the risk to a third party to manage.	Where an organization may lack certain skills and expertise it may outsource certain aspects of a project to another party, e.g. BAe Ship Building outsource marine engine manufacturing to Rolls-Royce plc.

Table 6.2: Four Basic Actions for Managing Risk (www.ogc.gov.uk)

These actions are sometimes referred to by the acronym **ACAT**. Once the risks have been assessed, and a suitable course of action identified (ACAT),

a risk treatment plan should be developed to document the decisions about how each risk should be managed.

It is worth noting that no risk management plan will ever be perfect. The development of an effective risk management plan is an iterative process that draws on knowledge acquired through similar experiences. Therefore, it is important to continually review and update the risk management plan. There are two main reasons for this:

- To evaluate whether the previously selected options for risk management are still relevant and effective.
- To evaluate the possible risk level changes in the business environment.

A final point for consideration is that over-prioritisation of the process of risk assessment could mean certain projects are never finished, or never get started. This may happen if projects are suspended or put on hold until the risk assessment process is complete. Therefore, spending too much time assessing and managing unlikely risks can divert resources that could be used more effectively. Unlikely events do occur but if the risk is unlikely enough to occur it may be better to simply retain the risk and deal with the result if the loss does in fact occur.

6.3.3 Developing a Capability for Managing Risk

Some of the most obvious risks now facing organizations include, but are not limited to, changing parameters around IT security, data protection and information privacy, business continuity and disaster recovery, IT investment and project delivery, service contracts and suppliers, and threats to business image and brand reputation. Within this fast-moving business environment, organizations cannot afford to stand still in terms of risk evaluation. Organizations that are serious about risk management must develop a capability to assess, monitor and manage the exposure to, and potential impact of IT-related risks.

In developing a risk management capability, the intent is to help organizations overcome some commonly experienced issues that can adversely affect the quality of a risk assessment. The following is not an exhaustive list but it provides some idea of the issues that organizations face

in developing a flexible and robust ability to manage risk. Barriers to conducting a successful risk assessment may include:

- The lack of a holistic view of risk management across the organization:
    - A functional approach, which can be reactionary and focused on "survivability".
    - A lack of cohesion to the overall business objectives.
    - A lack of recognition that IT risk management needs to be integrated with corporate risk management and other IT management activities.
- A lack of senior management support; risk management is low priority and seen as "insurance".
- A lack of clarity on the organization's overall risk tolerance.
- A lack of adequate funding/resources to conduct risk management activities.
- A lack of ability or interest by the business in quantifying the cost of outage, downtime, or loss of business applications.
- A lack of risk management training/ knowledge throughout the organization.
- A failure to define risk management skill sets.
- A mind-set in which risk management is seen as a hindrance, both as a barrier and non-value added to the business.

Developing an organizational capability around the management of risk will help the organization identify what is driving these barriers, and then provide guidance to rectify them through the development of an improvement road map for improved maturity.

One risk management capability is provided as part of the IT capability maturity framework (IT-CMF). The IT-CMF risk management capability covers three key areas; governance, profiling and coverage (see Figure 6.5).

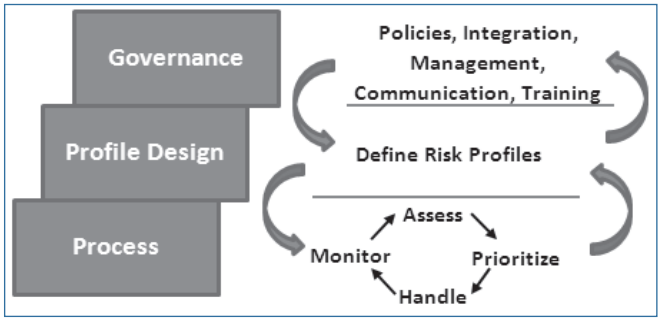
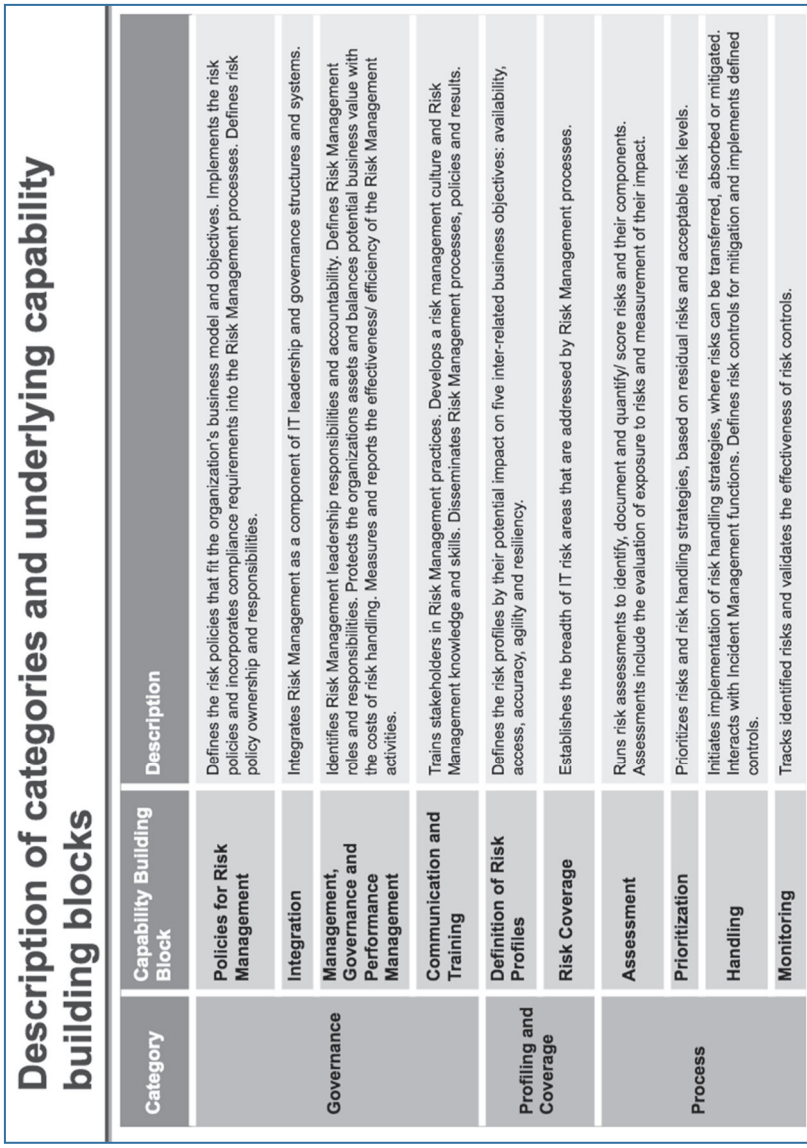


Figure 6.5: Components of the IT-CMF Risk Management Capability (www.ivi.ie)

Within each of these three component areas the capability is broken down further into ten capability building blocks (Figure 6.6).

The framework is designed to help organizations to identify their strengths and weaknesses in each of these areas in terms of where they are on a maturity spectrum. The concept of a maturity spectrum for assessing capability is not a new one. In 1987 Carnegie Mellon's Software Engineering Institute started to develop the capability maturity model integration (CMMI) framework for assessing the maturity and effectiveness of software development. This maturity model was then adopted and modified by the Innovation Value Institute in 2006 to develop the IT capability maturity model (IT-CMF). The maturity model is designed to develop a three-dimensional model that not only identifies if a capability is present, but also the effectiveness of the capability at delivering business value for the organization.



Description of categories and underlying capability building blocks

Category	Capability Building Block	Description
Governance	Policies for Risk Management	Defines the risk policies that fit the organization's business model and objectives. Implements the risk policies and incorporates compliance requirements into the Risk Management processes. Defines risk policy ownership and responsibilities.
	Integration	Integrates Risk Management as a component of IT leadership and governance structures and systems.
	Management, Governance and Performance Management	Identifies Risk Management leadership responsibilities and accountability. Defines Risk Management roles and responsibilities. Protects the organizations assets and balances potential business value with the costs of risk handling. Measures and reports the effectiveness/ efficiency of the Risk Management activities.
	Communication and Training	Trains stakeholders in Risk Management practices. Develops a risk management culture and Risk Management knowledge and skills. Disseminates Risk Management processes, policies and results.
Profiling and Coverage	Definition of Risk Profiles	Defines the risk profiles by their potential impact on five inter-related business objectives: availability, access, accuracy, agility and resiliency.
	Risk Coverage	Establishes the breadth of IT risk areas that are addressed by Risk Management processes.
Process	Assessment	Runs risk assessments to identify, document and quantify/ score risks and their components. Assessments include the evaluation of exposure to risks and measurement of their impact.
	Prioritization	Prioritizes risks and risk handling strategies, based on residual risks and acceptable risk levels.
	Handling	Initiates implementation of risk handling strategies, where risks can be transferred, absorbed or mitigated. Interacts with Incident Management functions. Defines risk controls for mitigation and implements defined controls.
	Monitoring	Tracks identified risks and validates the effectiveness of risk controls.

Figure 6.6: Risk Management Capability CBBs (www.ivi.ie)

Using this approach, Curley (2004) has taken the maturity profile originally defined by researchers at the Software Engineering Institute (SEI) at Carnegie Mellon University and applied it to the concept of IT capability maturity (SEI, 2002) (Table 6.3).

Level	Characteristic	Description
5	Optimised	World-class demonstrated; significant optimization/improvement focus.
4	Advanced	Very good or excellent in virtually all aspects; no real debilities.
3	Intermediate	Reasonably good approaches present may have slight deficiencies.
2	Basic	Elementary approaches emerging, some serious (but non-fatal) weaknesses.
1	Ad hoc	Inadequate approaches, potentially fatal flaws prevail.

Table 6.3: Maturity Summary (Curley, 2004)

At lower levels of maturity (levels 1 and 2), technology may be present but it has not been integrated or aligned to the organizational need in any structured or consistent manner. As maturity reaches level 3 the capability is being demonstrated in a consistent and effective way across the organization. At this level, the capability is seen as starting to provide business value to the organization (Curley, 2004). At level 3, processes are beginning to be better optimised and aligned across the organization. This level also sees an increase in cost savings and improved performance (Hartman, 2002). Levels 4 and 5 start to see the capability as driving real and sustainable value for the organization. However, for an organization to achieve these levels the work practices and culture may need to change significantly. In effect, to reach higher levels of maturity may require transformational change across the organization.

By developing a capability to manage risk an organization can look to realise the following benefits:

- Improve its ability to manage risks and protect the business from risk impacts.

- Reduce exposure to risks such as IT security, IT sabotage, data protection and information privacy, and IT investment risks.
- Increase the likelihood of meeting the scope, cost, time and quality targets of projects by effectively managing associated IT risks.
- Increase the likelihood of compliance with external regulations and ethics policies.
- Increase transparency of how IT risks map/relate to business objectives and decisions.

Today's organizations cannot afford to stand still in terms of risk evaluation. Organizations that are serious about risk management must develop a capability to assess, monitor and manage the exposure to, and potential impact of IT-related risks.

Time Out

Think about it: Failure to Act

Up until 2010 Borders Bookshop was a very successful international high-street retailer. It was founded in 1971 by Louis and Tom Borders who, having failed to interest existing booksellers in their system for tracking inventory and sales, decided to build a better bookseller themselves. Borders ushered in a revolution in book retailing. By the 1990s the large-format stores of Borders and its competitor Barnes & Noble had proven their dominance, and the two companies had a combined 40 per cent of the book-selling market.

Once it had achieved dominance, Borders embarked on an epic series of missteps:

- Aggressive expansion of its retail footprint saddled the company with long-term leases that would later prove a decisive factor in its bankruptcy.

- The company focused on having a superior selection to its competitor Barnes & Noble, ignoring the fact that customers were neither aware of nor (when made aware) impressed by this.

- Lack of control over its internet sales channel was a crippling strategic misstep. In 2001 Borders negotiated a deal to allow Amazon to control its online business, and it was not until 2008 that the company had its own website.

- Sales trends overall were incredibly worrisome. Between 1997 and 2009 sales per square foot declined nearly 34% (from 1997 $261 to $173).

- An increased focus on stocking more CDs and DVDs immediately preceded a plunge in sales of those items as consumers gravitated to digital delivery systems.

- The 2004 acquisition of the stationery company Paperchase only added exposure to another challenging retail niche.

- E-reader Kobo was insufficiently supported and never gained traction.

- Valuable cash ($600 million) was wasted on a stock buyback programme begun in 2005.

The endgame for Borders over the last few years was not good. Starved of cash and saddled with long-term leases for stores that were too big and in sub-par locations, when the company finally filed for bankruptcy it was too late. Creditors came to the conclusion that the best option for maximising their recovery would be total liquidation.

Interestingly, the industry now appears to be returning to its roots. While Barnes & Noble remains a player, anyone who has visited one of their stores recently must have noted the changing feel of the place; it is beginning to resemble a toy store that also sells books. Meanwhile, small local stores are coming back, filling in the niches and seeking to learn from the mistakes of one of the industry's former Goliaths.
(David Johnson, 2011)

Questions:

- Do you think Borders managed the alignment between its IS and business strategies in an effective manner?
- Do you think Borders had an effective governance structure based on the strategic decisions it made through the first decade of the 21st century?
- How do you think technology could have improved their chances of staying competitive, and in profit?
- How do you think Borders assessed and managed risk?

6.4 Learning Summary

Technology is reshaping the very business models and core processes that organizations are using to remain competitive. The levels of investment and risk associated with technology driven change are significant, and if they are not managed effectively, they can have disastrous effects on the organization's ability to survive.

Therefore, an organization needs to establish good governance practice to ensure it is making the right decisions concerning its technological investments. The purpose of good IT governance is not to define or agree the technical aspects of technological investment, but to ensure the investment is a good fit with the overall business strategy for the organization, and to ensure there is transparency and accountability amongst managers and key decision-makers.

Governance is not just an internal requirement or an administrative "house-keeping" activity. Good governance is needed to ensure that reputation and financial control are maintained, and that this can then be demonstrated to the broader stakeholder community. Many financial investment organizations now require evidence of governance practice before investing in or rating a publicly listed company. There are many examples of high-profile organizations that have failed to apply good governance (Eron, WorldCom, Lehmann Brothers, etc.), increasing the focus and demand for good governance practice in organizations.

As technology investments drive a significant expenditure level for organizations, the development of an IT governance framework has become an absolute necessity. The format of the IT governance framework is similar to that of any other functional governance framework (see Figure 1.1) and feeds into the overall corporate governance structure. A key function of the IT governance structure is to ensure any decisions concerning investment in technology are in line with the overall strategic vision. In effect, many organizations that succeed in aligning their technology to their business, do so with the support of an effective IT governance framework. This in turn results in improved organizational performance.

The development of an effective IT governance framework is not down to the IT function alone. For the IT governance framework to work, it must have input from non-technical functions across the organization. A failure to engage stakeholders from across the organization can result in a misalignment between the IS and business strategies. This will happen if the impacts of technological investments are not fully understood in terms of their contribution to business value. Therefore, the link between IT governance and corporate strategy must be effective at both the strategic and operational levels. This means that the IT governance systems must consider the risks and benefits in an open and transparent manner, and base the final decision on the overall benefits that the investment will bring to the business, rather than on the technical aspects alone.

However, the relationships between each of the stakeholder groups that inhabit a governance chain can be defined in terms of the "**Principal-Agent Model"**. This is also commonly referred to as the "**Theory of Agency**". This is where the "agent" is anyone authorised to act on behalf of a principal. Looking at the governance chain in Figure 6.1, the trustees of funds are the agents of the beneficiaries. This means that the trustees need to work on behalf of the beneficiaries. As agents of the trustees, investment managers must also work in a way that puts the trustees' best interests first. This principal-agent relationship continues on down through the chain to the managers, and from there to the non-management staff. Breaks in this communications chain, due to misunderstandings, mis-information, or personal interests being placed above those of the organization, are referred to as "**Agency Costs**". The existence of any of these agency costs may result in wrong decisions being taking, which in turn, may not be in the best interests of the organization's principals. By understanding which stakeholders make up the governance chain the organization can start to build an effective relationship map. This map is then used to identify the

principals and agents. The manner in which information flows up and down the chain is also vitally important. If misunderstandings occur, then the implications of decisions may not be understood. Finally, the governance structure must take various mechanisms into consideration to reduce the impact of "self-interest". These could include performance-related pay, profit sharing, regular performance reviews, and contract termination.

Assessing risk for any aspect of organizational strategy or operational decision-making, requires an ability to assess the levels of uncertainty and probability of failure, and the potential benefits, in terms of the business value that a decision will result in. Developing a capability to assess and manage risk is vitally important to good IT and corporate governance. If an organization is unable to assess risk for its technological investments then it will not be able to provide any level of assurance for success (or failure). The key stages in assessing risk are:

- **Identify risk:** This includes assessing the probability of failure and success.
- **Identify options**: What can the organization do to mitigate any of the identified risks?
- **Implement option**: This should focus on targeting the option offering the highest impact and most likely risks.
- **Monitor/Learn**: Monitor the progress and learn from the decisions made.

An effective risk management process and capability will not only help safeguard the organization against the impact of unanticipated risks and mitigate for them, but will build confidence in the organization's ability to take advantage of opportunities that may deliver additional business value.

For risk to be managed properly and consistently, managers need to understand risk and in particular how risk impacts the business. This is irrespective of the technology being considered. Once risk has been identified there are four basic actions that can be taken to manage the risk. These are avoid, control, accept, or transfer (ACAT). When considering risk and how it is managed, management needs to consider how to balance the need for cautious control and seizing an opportunity. If the risk management process becomes restrictive, it may prevent the organization from moving quickly to avail itself of new business opportunities.

Building a capability to manage risk is important if the organization is to develop a consistent and effective approach to assessing and handling risk. Developing an organizational capability around the management of risk will help to identify what is driving certain behaviours and views impacting how risks are assessed. This risk management capability can then provide the guidance to rectify these behaviours/views.

6.5 Case Study: Insure Co.

By the mid-1990s, the Insure Co. insurance company was not reacting fast enough to the market, could not launch new products quickly, and could not build complex, flexible products in a re-usable modular fashion.

Insure Co. recognised that to be a major life and pension company, it needed to transform its administrative and operational way of working. It needed a new "contract engine" for administrating and developing existing and future insurance policy products, a "client repository" data warehouse, improved speed and quality in customer service, a new call centre and improved communication channels. This amounted to what was acknowledged by senior managers as a business transformation agenda, in which IT was heavily implicated.

While the IT function had been streamlined and improved over several years, it was recognised that external IT-supplier help was needed. Of the two suppliers in the frame, SUPCO, a major multinational, was selected, essentially to transform the company's client administrative policy systems. An ambitious deadline of two years was agreed, and the terms were tough on the supplier. SUPCO was given overall programme leadership and had to deliver all components according to a strict schedule for a fixed price. The first deliverable – a statement of business requirements – was due within nine months. If it was not delivered, Insure Co. reserved the right to invoke a termination clause without penalties before any payment. Any other late delivery was subject to damages. Insure Co. also retained the right to change any requirements or specifications at any stage of the development. SUPCO signed the contract because they believed that if they could deliver on this contract, they could dominate the insurance market in terms of IT provision. They also believe

they had developed a model (IM) of the insurance industry that could help to identify Insure Co.'s information requirements very quickly.

To get such a good deal, Insure Co., through its contract negotiations, delayed the beginning of the work for SUPCO, which ate into the supplier's already very tight time targets. SUPCO's CEO, who was the major champion of the deal, resigned in the first two months of the project, leaving what we will call the CAPS (Client, Admin, Policy System) project to be delivered by four different functions within SUPCO. The supplier found it difficult to commission its most experienced project managers to work on CAPS, so the project managers appointed had little customer experience with such a large project. They quickly ran into difficulties, as it became obvious that SUPCO had greatly underestimated the size of the task and the complexity of insurance products and administration. They also made little headway with using the IM to drive out detailed business requirements. Eventually, they had to turn back to more traditional methods. While Insure Co. supplied many staff for the project and appointed several managers to certain positions, these all tended to wait for orders and stand back and wait for SUPCO to make the moves.

A steering committee met frequently as an increasing number of problems arose. Six months in, SUPCO brought in a senior project manager to audit progress. He recommended de-scoping the project, changing the time-scales, and moving many elements of the CAPS project to a pilot mode. He was made project manager but despite progress, SUPCO failed to meet the first deadline, with little sign of much progress in the foreseeable future.

The CEO of Insure Co. made the difficult decision to protect the company's interests, pay no fees and terminate the contract.

Questions:

- How would you describe the IT governance structure for Insure Co.?
- How did Insure Co. manage the risks associated with this project?
- What were the main causes of failure for the IS project?

- What advice would you give the management team of Insure Co. to ensure a failure like this does not happen again?

6.6 Review Questions

True/False Questions

6.1 IT governance is needed to ensure that IS strategies are designed in the right way. T or F?

6.2 IT governance is the sole responsibility of the CIO. T of F?

6.3 IT governance must consider the overall strategic needs of the organization. T or F?

6.4 Investments in technology should be left to those who understand the technology. T or F?

6.5 Good governance makes decision-making transparent, and people accountable. T or F?

6.6 Failure to apply governance practice will not really impact organizational performance. T or F?

6.7 Good governance assures the representation of all stakeholder groups in the decision-making process. T or F?

6.8 IT governance is very different to other forms of governance such as financial or research governance. T or F?

6.9 In the IT governance chain the CIO has the final say concerning IT investments. T or F?

6.10 IT governance is mainly interested in the assessment of technical risk. T or F?

6.11 The principal-agent relationship is a key consideration when defining the stakeholders in a governance chain. T or F?

6.12 An effective IT governance system will help to identify and manage risk associated with technology investments. T or F?

6.13 Changing parameters around IT security is a major risk factor for organizations. T or F?

6.14 Organizations that are serious about risk management must develop a capability to assess, monitor and manage the exposure to, and potential impact of, IT-related risks. T or F?

6.15 Managing risk should help to objectively assess the different options available, and governance will help to ensure that the decisions for and against different options are weighed up fairly and equitably. T or F?

6.16 A tighter linkage between the technology and business model performance means that the IT function cannot be left to govern how technology is assessed, invested in, implemented, and reviewed in terms of its business value to the organization as a whole. T or F?

6.17 IT governance is not dependent on alignment between IS and business strategies. T or F?

6.18 Governance is an internal control process only of real interest to the senior management team. T or F?

6.19 IT governance is not so much about the actual management of technology, but more about the effective alignment of technology to the business. T or F?

6.20 CoBIT provides a framework for IT governance. T or F?

6.21 IT governance is about control, and adherence to a set of rigid standards and policies. T or F?

6.22 Effective governance requires good communication, negotiation, and relationship building skills. T or F?
6.23 If IS investments are not delivering good business value then the organization needs to consider its IT governance practices. T or F?

6.24 Risk management is all about identifying the negative outcomes associated with a proposed investment. T or F?

6.25 A failure to manage IT risk may result in financial loss, including the loss of intellectual property. T or F?

6.26 The purpose of a risk management capability is to ensure compliance with risk management policy. T or F?

6.27 Developing a risk management capability will help to develop a holistic view of risk across the organization. T or F?

6.28 An effective risk management capability can help to increase transparency of how IT risks map/ relate to business objectives and decisions. T or F?

Multiple Choice Questions

6.29 Which of the following needs to be considered when developing a governance chain?

A. Employees' sense of empowerment
B. Who the principals and agents are across the governance chain
C. The managerial span of control.
D. The technical competence of governance board members

6.30 Which of the following is not a reason for the implementation of a governance system?

A. The separation of ownership and management control
B. Avoiding corporate scandals
C. The increased level of influence of the CIO within the Executive Board.
D. The increased accountability to wider stakeholder interests

6.31 Which of the following is not a main reporting component of the IT governance chain?

A. Board of directors
B. CIO
C. IT project/service delivery managers
D. Technology end users

6.32 Which of the following is not a circumstance for incurring agency costs?

A. Self-interest
B. Asymmetrical information

C. Employee empowerment
D. Misalignment of incentive

6.33 Which of the following is not really a way of driving business value from IT capability?

A. Assigning accountability for organizational changes
B. Learning from each IT implementation
C. Managing spend, and assessing the value realised
D. Continually striving to implement the latest technology.

6.34 Which of the following is not a key element of the CoBIT governance framework?

A. Strategic alignment
B. Resource management
C. Performance measurement
D. Skills development

6.35 Which of the following is not a core deliverable for the CoBIT governance framework?

A. Supporting and enabling better business and IS/IT strategy alignment
B. Using technology to enable the business and maximise benefits
C. Improving competitive analysis
D. Ensuring technology-based resources are used responsibly and effectively

6.36 According to Weill & Ross (2004), which of the following is not a governance mechanism?

A. The communications approach
B. Alignment processes
C. The span of control
D. Decision-making structures

6.37 Which of the following is not considered a key focus for IT governance?

A. Ensuring the technical competency of IT staff
B. Minimising investment risk
C. Minimising failure of service
D. Ensuring compliance

6.38 Which of the following is not a key stage in the risk management process?

A. Identifying risk
B. Identifying options
C. Implementing options
D. Reporting on the option outcome

4.39 Which of the following is not a typical cause of risk failure for IS projects?

A. Design and definition failure

B. Decision-making failure
C. Supplier management failure
D. Technology access failure

4.40 Which of the following actions is not an option for managing risk?

A. Avoid
B. Consolidate
C. Accept
D. Transfer

4.41 Which of the following is not a benefit realised through risk management capability improvement?

A. Improved ability to manage risk
B. Reduced exposure to risks such as IT security, sabotage, data protection, etc.
C. Increased regulatory compliance
D. Increased autonomy for the IT function

6.7 Review Question Answers

True/False Answers

6.1 F, 6.2 F, 6.3 T, 6.4 F, 6.5 T, 6.6 F, 6.7 T, 6.8 F, 6.9 F
6.10 F, 6.11 T, 6.12 T, 6.13 T, 6.14 T, 6.15 T, 6.16 T
6.17 F, 6.18 F, 6.19 T, 6.20 F, 6.21 F, 6.22 T, 6.23 T
6.24 F, 6.25 T, 6.26 F, 6.27 T, 6.28 T

Multiple Choice Answers

6.29 B, 6.30 C, 6.31 D, 6.32 C, 6.33 D, 6.34 D
6.35 C, 6.36 C, 6.37 A, 6.38 D, 4.39 D, 4.40 B
4.41 D

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Chapter 7: Using Technology to Support Knowledge and Innovation

Learning Objectives

On successful completion of the course a student will be able to:

- Define the different types of knowledge and their characteristics.
- Describe the difference between information and knowledge.
- Identify the main barriers to knowledge creation and sharing.
- Identify how emergent technologies can benefit an organization's end-to-end performance in terms of driving innovation, co-creation of value, and knowledge creation.
- Identify where, and what type of knowledge transfer is needed within an organization based on operational imperatives, and how technology can impact the transfer.

7.1 Introduction

According to Prusak (2001), knowledge management is not only a consultant's invention but also a practitioner-based, substantive response to real social and economic trends – such as globalisation, ubiquitous computing, and a knowledge-centric view of the company. Over recent years, many academics and organizations have developed techniques to help understand how information flows within an organization, and processes try and manage the information so as to be useful and relevant. So why is knowledge management (KM) still not a main component of every businesses strategic tool kit? Where are all the examples for KM success? Despite the fact that a number of case studies (Bhatt *et al.,* 2001) highlight the competitive advantages of 3M, Hewlett-Packard, Buckman Laboratories, Scandia AFS, and Xerox as a result of KM projects, they do not clearly describe the principles and procedures of KM that have been used. In particular, how these companies are able to capture and effectively manage the flow of different types of knowledge is not made clear. From information acquired on these companies their KM successes have had the following themes running through them:

- Successful knowledge transfer is mainly based on technology-driven knowledge transfer (Lotus Notes, email, workrooms, etc.), as personal knowledge is difficult to capture (Marwick, 2001).

- There's no clear indication of why the company believes it has a "successful KM strategy". How they are measuring their success is unclear – it is doubtful that they are using the same yardstick so in effect one company's success could be another's failure (Kalling, 2003).

- All of these organizations have an awareness of the importance of teams. Therefore, the team dynamic is seen as key to organizational success.

Organizations that are strategically aware of the importance of KM implement their KM programmes using one of two approaches (Hansen *et al.,* 1999).

- **Technology driven** – (***codified systems***): The use of technology to support and manage explicit knowledge.

- **Team driven** – (***personalised systems***): The development of teams and the flow of tacit knowledge via the team dynamic.

The concern raised is that technology driven and personal knowledge do not always flow along the same paths. According to Nonaka *et al.* (1995), the key to knowledge creation lies in the mobilisation and conversion of tacit knowledge to explicit knowledge. Now we just need to define what we mean by "tacit" and "explicit" knowledge.

7.1.1 Tacit and Explicit Knowledge

Two key components to knowledge as generated and used within any organization are **Explicit** and **Tacit** knowledge (Polanyi, 1958; Nonaka *et al.,* 2000; Smith 2001). Tacit knowledge is very much dependent on an individual's experiences and perspectives. This is difficult to capture from a technology systems' perspective, with most knowledge management (KM) systems relying on explicit knowledge capture as the main focus. In fact, some researchers make the point that in order to improve KM efficiency an organization must focus on IT and intelligent agents (Carneiro,

2001). According to Johannessen *et al.* (2001), there is a real danger that as IT solutions are focused mainly on explicit knowledge, this may relegate tacit knowledge to the background and hence a system may develop that fails to capture personal knowledge. Therefore, in order for KM systems to maximise their potential they need to be able to address the question of how to capture and work with tacit knowledge as well as explicit knowledge through the use of IT systems. From an organizational perspective this means understanding how knowledge becomes embedded in organizations, what form this knowledge takes, and how individuals react to, and draw on it.

A lot of development work is going on to capture tacit knowledge using such techniques as story-telling, collaboration, social network analysis, etc. However, these techniques provide methods of identifying and capturing knowledge – as yet it has to be shown that the technology is currently in place to automate and manage these processes effectively.

Although the concept of tacit knowledge is clearly defined and understood from a psychologist's perspective (Shirley & Langan-Fox, 1996; Sternberg, 1997) the view of Nonaka (1995) is that measuring tacit knowledge is a "risky proposition". Nonaka's reasoning being that this form of knowledge is too abstract and elusive in nature, and therefore, exceedingly difficult to capture. Even though researchers such as Castillo (2002) try to break down tacit knowledge into more manageable sub-groups – in this case *socio-cultural*, *semantic*, and *sagacious* tacit knowledge – the fundamental distinguishing characteristic does not change. It is this abstract and elusive characteristic that continues to make tacit knowledge difficult, if not impossible to capture. So, does this mean that of the two components of knowledge, explicit is merely information, and tacit is too abstract a concept to manage? If this is the case how can these two components be managed? If one considers the definition of knowledge it becomes clear that the focus should not be on the management of any one component. The point of interest is not how tacit and explicit knowledge function on their own, but how tacit and explicit knowledge interact, and possibly how information and knowledge are created or lost through this continuous process.

Therefore, how do these organizations manage to ensure their teams allow the flow of knowledge to continue unrestricted? Globalisation has placed businesses everywhere in new and different competitive situations where knowledgeable, effective behaviour is necessary to provide a competitive edge. Enterprises have turned to explicit and systematic knowledge

management to develop the intellectual capital needed to succeed. Further developments are expected to provide considerable benefits resulting from changes in the workplace and in management and operational practices. Changes will partly come from information technology and artificial intelligence developments. However, more important changes are expected in people-centric practices to build, apply, and deploy knowledge and understanding for the support of innovative and effective knowledge-intensive work.

7.1.2 Harnessing Tacit Knowledge

However, in today's business environment, organizations are constantly re-organising and re-inventing themselves. The "knowledge-worker" (Drucker, 1993) is becoming more mobile which is resulting in a greater mobility in the workforce at large. Gone are the days when a person joined a company and stayed for life. For workers to "sell" themselves to organizations they need to show themselves to be "knowledgeable" within their field of expertise. Knowledge is the "new currency and organizations will pay highly for it" (Davenport & Prusak, 2000).

This now raises an interesting problem. In order for organizations to maximise their competitive edge, they need to capture and utilise the tacit knowledge held by their employees. However, it's this very tacit knowledge that workers see as being the key reason for their employment. In order for workers to share this information there needs to be an environment of trust between the giver and the receiver of any knowledge.

Now consider the emergence of the supply chain as a recognised strategic element of the core business activity (Van Weele, 2002; Lee, 2002; Moberg *et al.,* 2003). The new organizational focus is forcing internal business units and functions to work closer and more openly. To work effectively this requires business units and functions to have more in-depth knowledge of the other functions within the supply chain. However, when an organization then out-sources supply-chain activities such as manufacturing and distribution this introduces an additional level of complexity.

With respect to such a complex supply chain, how does an organization now identify the knowledge components it needs to keep "in-house" to effectively manage its overall company competitiveness?

This is an interesting question that assumes the organization in question has already rolled out an effective knowledge management programme. This is

not always the case. Therefore, in the complex supply chain how does the organization ensure that the focus is kept on core activities, and the workforce is pro-actively driving the knowledge flow throughout the supply chain? This question will be addressed though the course of this chapter.

7.1.3 Why is creating Knowledge Important Now?

Knowledge is a complex, intangible asset within any organization, and for centuries businesses have been operating successfully without the need to explicitly focus on the capture and management of this asset. So why is it important now? In fact, up until the mid/late 1990s knowledge transfer had received little focus from mainstream economics and the social sciences. Certainly, the work of Nonaka & Takeuchi (1995) helped to push the capture and control of knowledge to the fore as an important area for further study. However, the slow realisation that knowledge was a key component to the success of any organization was picked up by Drucker (1993). As far back as the 1960s Drucker coined the term "knowledge worker" as it became apparent that post-war industry was shifting away from production to services. This is a view that has been subsequently borne out by Quinn (1992) who observed that the US economy has been fundamentally restructured by the service industry, and up to 95% of manufacturing firms' employees are engaged in service activities. According to Drucker (1993), we are entering "the knowledge society" in which the basic economic resource is no longer capital, natural resources, or labour, but "is and will be knowledge". Within this new society "knowledge" workers will play a central role.

Nonaka *et al.* (1995) supported this view by pointing out that society has undergone many changes and the manufacturing-based industries of the post-WWII economies have not remained unaffected. According to leading management thinkers, the manufacturing, services, and information sectors will be based on knowledge in the coming age, and business organizations will evolve into knowledge creators in many ways.

Drucker (1993) also suggests that the most important challenge for every organization in the knowledge society is to build systematic practices for managing self-transformation. In effect, the organization has to be prepared to discard obsolete knowledge and learn to create new ideas, processes, and paradigms through the following:

1. Continuing the improvement of every activity.

2. The development of new applications from its own successes.

3. Continuous innovation as an organised process.

Drucker's views are strong on the need for organizations to focus on knowledge creation and management. Through his views, Drucker focuses on the need to invest in the identification, creation and management of tacit knowledge.

7.1.4 What's the Difference between Information and Knowledge?

As discussed, knowledge is an abstract concept that can mean different things to different people when viewed in different contexts. A commonly accepted definition from Davenport *et al.* (1998) that is used to identify knowledge from a complex organizational perspective, is as follows:

"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a frame work for evaluating and incorporating new experiences and information."

(Davenport and Prusak, 1998)

Even this definition (Davenport *et al.,* 1998) is open to interpretation. One of the questions asked by many business professionals is **"*What's the difference, if any, between information and knowledge?*"** Fuller (2001) addresses this question by highlighting the fact that the terms are often used to mean the same thing. This is a view that is also supported by Tsoukas (2005). This in effect has reduced the significance of knowledge, often reducing it to mere information. The qualities of knowledge, as a classic philosophical concept are lost. Fuller (2001) looks at the original meaning of information in order to try and distinguish between information and knowledge. The term "information" was derived during the Middle Ages from a Latin word used to describe the process by which documents were transferred, or communicated, from one entity to another. As for "knowledge", this was the mind's representation of this process, which in turn was usually understood in relatively passive terms. Knowledge, in effect, was the result of the mind's receptiveness to what lies outside it.
Simons' (1945) seminal work "Administrative Behaviour" and March & Simons' (1958) "Organizations" also tackled the question concerning the difference between information and knowledge. Simons (1945) developed

and used the concept of **Bounded Rationality** to build a computer model of the human thought process as a form of information processing. Simons found that according to his model, humans act as information processing systems that extract "meaning structures" from information inputs through sensory organs, and store these meaning structures as new knowledge. Although Simons' views failed to capture the proactive nature of humans in problem-solving and the subsequent generation of new knowledge, his view that information only becomes knowledge within the context of the human mind still has strong support throughout the academic community.

Pondering the differences between information and knowledge is not limited to thinkers within the academic world. As a sign of how important is the need to understand the fundamental differences between these two concepts, organizations such as KPMG have invested significant time and resources into understanding the difference. From KPMG's perspective, the difference between knowledge and information is the clear emphasis on the proactive involvement of users. Nonaka & Takeuchi (1995) also support this view by basing the difference between knowledge and information on three observations.

1. ***Knowledge, unlike information, is about belief and commitment****. Knowledge is a function of a particular stance, perspective, or intention.*

2. ***Knowledge is about action****. It is always knowledge to some end.*

3. ***Knowledge, like information is about meaning****. It is context specific and rational.*

According to Shannon & Weaver (1949), information should be viewed as *syntactic* and *semantic* in order to further understand the differences between information and knowledge. **Syntactic** refers to the volume of information, whilst **Semantic** refers to the meaning of information (Shannon *et al.,* 1949). The semantic aspect of information is more important for knowledge creation (Nonaka *et al.,* 1995) as it focuses on the conveyed meaning. If an organization limits its focus to syntactic information the real importance of information as part of the knowledge creating process will be unrealised. The focus will settle on the processing of information as opposed to the meaning and relevance of information. So, even the term "information" can be interpreted in one of two ways. This is an important point when one considers how organizations manage

information. According to Nonaka *et al.* (1995) and Shannon *et al.* (1949), information systems which are developed to move information, with little or no concern for its meaning do not support knowledge creation. Therefore, for information to contribute to knowledge creation, the information must contain semantic and syntactic components. Nonaka *et al.* (1995) then conclude by providing a statement that helps to clarify not so much the difference between information and knowledge, but the relationship between them.

"…Information is a flow of messages, while knowledge is created by that very flow of information, anchored in the beliefs and commitment of its holder." (Nonaka & Takeuchi, 1995)

Time Out

Think about it: The Value of information

You have just taken up the role of CIO for an international research company called DataSense LLP. The organization conducts contracted government and commercial research with a social science/economic/business focus.

Although DataSense LLP has a globally recognised brand, it has been keen to build its business and research reputation in India and South East Asia. Six months ago, the opportunity to take over an Indian research company called InfoScience presented itself and the board approved the take-over bid. The offer was accepted and DataSense is now in the process of integrating the common systems and processes of the two organizations. The CEO and senior management team of DataSense believe that a smooth transition will give DataSense access to 23% of the potential commercial research market for India. Therefore, there is significant focus on ensuring the merging of InfoScience into DataSense goes smoothly and without any major problems.

As CIO you have been tasked, by Dr Chen Yung (CEO), to look at the information creating/sharing/storing habits of both companies and implementing the best processes and systems to ensure ongoing

operational performance. Dr Yung is at pains to point out that DataSense LLP is basically a "knowledge creating" company, and all employees are effectively "knowledge workers". Your predecessor failed to grasp the significance of this and was let go from the company because he focused too much on the "explicit" aspect of knowledge. You are keen not to make the same mistake.

Questions:

- Do you think it makes any difference to think in terms of information or knowledge systems when looking at the different technologies in each company?
- Does it help to think of information in terms of syntactic and semantic information types?
- Should the CIO just concern himself with the way technology supports the flow, access, and storage of data/information or is there a broader context that needs to be considered?

7.2. Knowledge and the Learning Organization

To ensure the success of any knowledge management initiative an organization must develop a desire for knowledge amongst their employees (Quinn *et al.,* 1996). According to Kluge *et al.* (2001), if a knowledge programme is to be embraced by the workforce every individual needs to be thirsty for knowledge. The employee should see knowledge management (KM), or to be precise the active application, distribution and cultivation of knowledge, as a fundamental part of their personal success and satisfaction.

The importance of the individual in the creation and sharing of information and knowledge is a widely supported view (Krogh *et al.,* 2000, Kluge *et al.* 2001). Therefore, if one accepts the importance of information access and sharing, and knowledge creation as part of an organization's ability to learn and be innovative (Krogh *et al.,* 2000, Davenport, 2005), then the interaction of individual employees with core processes will have significant impact on process performance.

In order to develop a "learning" mentality within the organization, a knowledge or information "pull" culture needs to be encouraged over a knowledge or information "push" culture. An important aspect of the "pull" delivery mechanism is that it focuses heavily on the softer aspects of management and as a result a lot of organizations fail to engage in developing a successful "pull" culture and miss out on the benefits of a "bottom-up" knowledge delivery system (Kluge *et al.,* 2001).

7.2.1 Nonaka's Model for Learning Organizations

In 1995 Nonaka and Takeuchi produced their seminal work on the way that organizations learn through tacit-to-explicit knowledge conversion. The work was largely influenced by Polanyi's (1956) work identifying tacit knowledge as a form of knowledge. In their work Nonaka *et al.* (1995) proposed four modes of knowledge conversion that are shown in Figure 7.1.

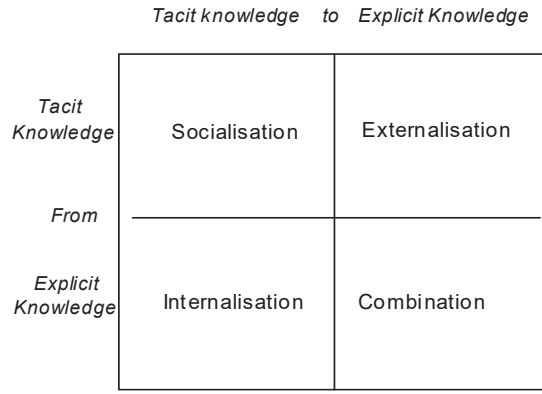

Figure 7.1: Modes of Knowledge Conversion **(**source: Nonaka *et al.,* 1995)

The modes referred to how Nonaka and Takeuchi perceived knowledge to form and transfer between tacit and explicit states through different stages. The four stages as identified by Nonaka *et al.* (1995) are:

1. **Socialisation** – **Tacit to Tacit**: When individuals share personal knowledge with their peers through personal contact/interaction.

An example of this is when individuals share common experiences in meetings, over coffee, at the water cooler.

2. **Externalisation** – **Tacit to Explicit**: When individuals codify their tacit knowledge. An example of this is when individuals load information onto ICT systems or write reports/documents.

3. **Combination** – **Explicit to Explicit**: When information in one codified format is transferred, or re-formatted into another codified format. An example of this is when ICT systems transfer data/information between each other.

4. **Internalisation** – **Explicit to Tacit**: When individuals try to take codified information and contextualise it in order to develop tacit knowledge. An example of this is when individuals pull information from ICT systems/reports/documents.

It is important to point out that there is some concern over the way that Nonaka *et al.* (1995) describe the process of socialisation, or more specifically how tacit-to-tacit transfer can happen (Wilson, 2002). Assuming the absence of telepathy amongst employees, how can tacit knowledge be shared without first being explicitly expressed through, say, speech? If we accept the definition of tacit knowledge as already provided in this chapter, then we must accept that pure tacit-to-tacit transfer cannot happen without an explicit element. Most researchers and KM professionals accept this argument, but still accept the process of socialisation as a valid stage in the learning organization model for the following reason. If one looks at the stages as relative knowledge transfer stages, then the tacit-to-tacit transfer can have an explicit component. What is important is that the type of knowledge transfer is happening between individuals on a face-to-face level. So, although speech may be used to explicitly express the thoughts of an individual, gestures, facial expressions, situational context, practical examples, and vocal inflections will all complement the verbal (or written) explicit knowledge being passed on. Therefore, a significant difference between *socialisation* and the other three stages is the level of contextual, semiotic and personal information that is transferred with the explicit knowledge. Once again, it is expected that knowledge will be lost through the tacit-to-tacit transfer process.

Nonaka *et al.* (1995) also identified a pattern of information and knowledge flow around this model. They proposed that knowledge would accrue and grow through the transfer process where tacit transformed to explicit, and

back to tacit. Figure 7.2 shows how Nonaka *et al.* (1995) believed that organizations developed internal knowledge as part of their learning process.

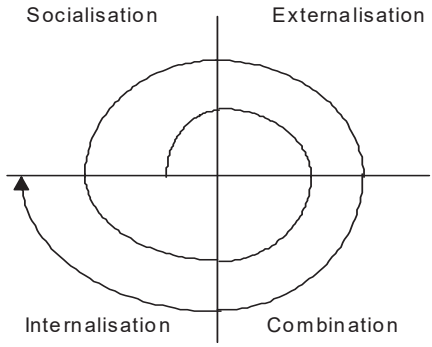

Figure 7.2 Knowledge Flow in a Learning Organization (source: Nonaka & Takeuchi, 1995)

The model shows an outward spiral representing increasing knowledge. This knowledge is growing as it passes through the four stages of tacit/explicit interaction. This theoretical model is widely cited as showing how knowledge, as a combination of tacit and explicit, behaves within an organization.

However, to accept this model is to accept the fact that there is no or negligible knowledge loss between tacit and explicit and back to tacit at any stage along the process. If we assume that people do not tell all they know, or write down all they know then one can assume there will be some knowledge loss through this process. Herschel *et al.* (2001) support this view that failure to focus on the tacit-to-explicit transfer points will impact the knowledge amplification process across the organization.

Can we identify what will cause this knowledge loss, and develop a framework for reducing the impact? In order to allow and encourage knowledge transfer, the barriers that inhibit transfer must first be identified. This is a key stage if an understanding of how organizations should define their knowledge strategy is to be developed.

7.2.2 Identifying Barriers to Knowledge Creation and Sharing

The academic and practitioner literature relating to barriers that are likely to impact or impede attempts to enhance process performance through more effective and efficient KM initiatives, is both extensive and varied. Kluge *et al.* (2001) identify two main barriers to developing a knowledge creating and sharing culture. The barriers are:

- ***Not invented here***… The "not invented here" syndrome describes the tendency to neglect, ignore or, worse still, disparage knowledge that is not created within an individual's sphere of interest. This problem can arise from a genuine mistrust of external knowledge sources.
- ***Knowledge is power***… The "knowledge is power" syndrome refers to a mind-set that places the value of knowledge to the individual ahead of its value to the company.

At its most basic, knowledge sharing starts by taking the time to help others. In a successful company there is always time pressure but the extra ten minutes spent with a colleague explaining something will be repaid later. However, just as people distrust external knowledge, they also see their own knowledge as part of their personal competitive advantage. McKinsey's "Corporate Prisoner Dilemma" illustrates this point very well, which is a modification of game theory's prisoner dilemma. Figure 7.3 demonstrates the corporate prisoner dilemma.

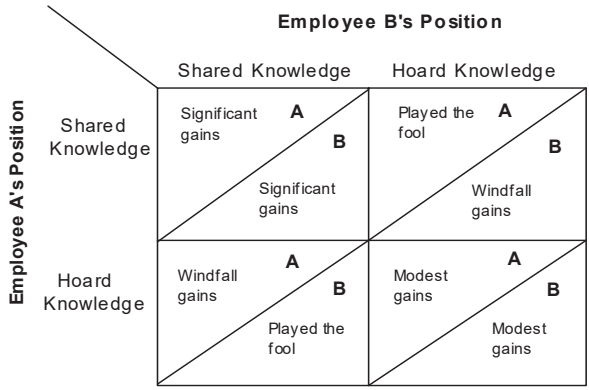

Figure 7.3: Corporate Prisoner Dilemma (source: McKinsey Co.)

From Figure 7.3 we can see that the ideal solution is for employees A and B to share knowledge, as this is where the most significant gains may be expected. However, if one employee decides to hoard knowledge whilst the other shares knowledge then the power balance is shifted in favour of the employee who hoards. As no employee wishes to be taken advantage of, or if the culture is one where individual performance is rated above team performance, the expected behaviour will be both employees hoarding knowledge. This will maintain a status quo where employees are keen to ensure their personal competitive advantage is not eroded. That said, the overall effect within the organization is one where knowledge is selectively shared resulting in modest gains in performance for the organization. If this is the norm within the organization the hoarding process will be counter-productive. This is one of the critical changes that should be targeted by any KM programme, and one that should have positive repercussions purely beyond the exchange of knowledge.

Whilst Kluge *et al.* (2001) acknowledge the importance of technology in delivering information at the right time and place, the deciding factor as to whether an organization will benefit is down to how the employees pull and share information and knowledge. In essence, their research shows that successful organizations use a combination of both push and pull; push systems being top-down in design and dependent on technology for knowledge/information to flow, and pull systems being bottom-up in design and more dependent on an individual's innate desire for knowledge. It is this desire coupled with a culture of cooperation throughout the organization that determines how successful the pull delivery mechanism will be.

Szulanski (1996) also supports the view that relationships between employees contribute to knowledge transfer failures. However, he points out that prior research suggests that four sets of factors are likely to influence the difficulty of knowledge transfer. These are…

1. Characteristics of the knowledge transferred.
2. Characteristics of the source of the knowledge.
3. Characteristics of the recipient of the knowledge/information.
4. The context in which the knowledge/information is transferred.

Some authors place an almost exclusive emphasis on the attributes of the knowledge transferred (Zander and Kogut, 1995, Winters, 1987). Others stress the characteristics of the situation in which the transfer occurs (Arrow, 1969). However, all four sets of factors can be used together in a model that

allows their relative influence to be measured. Szulanski (1996) states that contrary to conventional wisdom that places primary blame on motivational factors, the major barriers to internal knowledge transfer are shown to be knowledge-related such as the recipient's lack of absorptive capacity, causal ambiguity, and an arduous relationship between the source and the recipient. Szulanski's research was derived from a series of manufacturing sites, and therefore, it cannot be simply assumed that his findings will be relevant within an organization's complex supply chain. That said, there is no reason to believe that the barriers described will not impact knowledge transfer to a greater or lesser degree within any organizational context.

Gupta & Michailova (2004) found that knowledge sharing among departments within the same organization is, in reality, not as natural as it may appear. In fact, knowledge sharing hostility is a phenomenon that widely dominates organizational reality (Husted & Michailova, 2002). Gupta & Michailova (2004) identified three difficulties with the process of sharing knowledge:

1. **Knowledge is developed at a local level**: By definition, knowledge is embedded in a certain cognitive and behavioural context. Without understanding the context, one cannot inquire into the reasoning and assumptions behind the particular piece of knowledge.
2. **Knowledge is asymmetrically distributed**: Often, those who possess the knowledge are not inclined to invest time and effort to share it without expecting reciprocity, as resources are finite and scarce (Davenport & Prusak, 1998, O'Dell & Grayson, 1998).
3. **Knowledge sharing is voluntary**: Efficient knowledge sharing depends on the willingness of individuals to identify the knowledge they possess and to share the knowledge when required (Nonaka, 1994).

Moreover, Gupta & Michailova (2004) believe that an individual's ability to appreciate new knowledge is a function of their **absorptive capacity**. This is an individual's ability to recognise the value of new information, assimilate the information, and then act on that information.

What is interesting about Gupta & Michailova's (2004) research is that it does not look at the organization as a single entity but as a collection of departments working together, and the different demands they place on knowledge creation. Gupta & Michailova view knowledge as being either **Codified** or **Personalised**. Codified systems are focused on supporting

explicit knowledge transfer, whereas personalised systems are focused on supporting tacit knowledge transfer. Through their research they identified three aspects of a complex organization that can hinder knowledge creation and sharing.

1. **The nature of the different businesses means different knowledge management requirements**: Some departments or business units will operate within different environments; some being more stable than others. Therefore, KM systems may need to be modified by department in order to support the internal knowledge creation process.
2. **The different natures of the different business activities**: The nature of the different businesses predisposes different requirements for the type of knowledge sought as well as different preferences for how the needed knowledge is obtained.
3. **The way codified and personalised systems are used within each department or business unit**: Although the common practice is to assess organizations for codified or personalised knowledge systems, at a departmental level depending on the mission and expected deliverables of the department, the best fit from a codified or personalised strategy may not fit with the overall organizational assessment.

This last point is especially important as the reality of today's organization, especially a complex supply chain, is that roles and expected deliverables will vary between departments or business units. Therefore, when defining a knowledge strategy, an understanding of how departments, or business units that make up the organization, use information and create knowledge needs to be taken into consideration.

What is also interesting is the strong belief that technology, as the primary focus in knowledge delivery systems, has time and time again failed to deliver. The assumption that KM relies heavily upon social patterns, practices, and processes goes far beyond computer-based technologies and infrastructures. Empirical evidence on barriers to knowledge sharing stresses the importance of behavioural and cultural factors rather than outlining reasons associated with technology (Skyrme & Amidon, 1997; De Long & Fahey, 2000). Hence, the emphasis on the role of technology, specifically knowledge codification, in developing a holistic KM system has also been questioned by Spender (1996) and Tsoukas (1996).

Pawar *et al.* (2002) also question the effectiveness of a purely codified (technology-driven) approach to KM. It is their belief that modern management practice has only tended to focus on centralising, controlling, and standardising knowledge. Such codification allows the marginal cost of knowledge acquisition to be reduced by economies of scale (assuming the codified knowledge is relevant and useful). This underlying philosophy in the business environment has motivated an immense interest over the last decade in KM as a business field. Pawar *et al.* (2002), at the same time, realise the place that technology has within the effective coordination of knowledge. However, they feel that humans play more of a central role in the identification, acquisition, generation, storage, structuring, distribution, and assessment of knowledge. It is interesting that the views of Pawar *et al.* (2002), although taking the softer aspects of KM into consideration, do not really look at how organizations get their employees to "pull" knowledge. Malhotra (2001) also believes, in line with Kluge *et al.* (2001), that there is an overarching need for the building of a knowledge culture within an organization, and the responsibility for developing this culture does not rest with the information technology specialists. In order to achieve this, Malhotra (2001) believes that organizations should focus on rewarding employees for their contribution, and ensuring organizations track intellectual assets to show staff that knowledge is regarded as a valuable commodity; views which are supported by Kluge *et al.* (2001).

The literature on human issues in the vast area of knowledge management is somewhat sparse in comparison, but a study carried out by KPMG highlighted that there is not only a lack of understanding about KM and its benefits but there is a lack of skills within people of specific KM techniques. Barson *et al.* (2000) look at barriers to successful knowledge transfer using the TOP (Technological, Organizational, People) socio-technical systems classification, as put forward by Brandt and Hartmann (1999). The categorisation of barriers by Barson *et al.* (2000) is outlined in Table 7.1.

Technology	Organization	People
Existing resource	Existing resource	Existing resource
Available technology	Need for rewards	Need for rewards
Legacy systems	Culture	Culture
	Targeting	Internal resistance
	Costs	Self-interest
	Proprietary knowledge	Trust
	Distance	Risk
		Fear of exploitation
		Fear of contamination

Table 7.1: Barriers to Knowledge Sharing and Management (source: Barson *et al.,* 2000)

This is an interesting perspective because, as many organizations fail to maximise on knowledge management performance due to a failure to address the softer issues, it can be equally detrimental to performance if technical and indeed organizational issues are also neglected. An emerging perspective is that KM must be viewed from a holistic perspective. Failure to do so will result in an organization's failure to realise its potential to create and share knowledge.

What can also be seen from Barson *et al.*'s (2000) view of barriers is that there is another category that can be identified. This is the list of all cross-category barriers. This category contains all the barriers that exist in more than one of the three main TOP barrier groups. A more detailed description of the Barson *et al.* (2000) categorisations of the four barrier classes is given below:

1. Cross-category Barriers

- **Existing resource**: Simply put, there must be the required resource available if an organization is to operate knowledge creation and sharing. The organization must also have employees who can

implement and develop the knowledge that has been accrued. This is implying a "pull" knowledge culture.

- **Need for rewards**: This barrier concerns both the organization and people. Rajan *et al.* (1998), cited by Scarborough *et al.* (1999), states that "it is essential that employees can see that sharing means immediate gains such as less hassle, or easier tasks, reducing working hours or earlier closing." The need for rewards is a people issue whereas the mechanism for conferring rewards is an organizational issue.
- **Culture**: The Lotus Corporation (and indeed Kluge *et al.,* 2001) points out that a company's culture may not support the sharing and reuse of knowledge. Although Lotus recommends overcoming this barrier through technology the general view is that this should happen through a combination of codified and personalised methods. It is also important to look at culture from a push or pull perspective as this largely determines how employees will access and use the information available. If the culture is predominantly either "push" or "pull", this may be seen as a barrier as either the soft aspects of KM are being overlooked or the IT systems are not in place to support information routing and sharing.

2. Technological Barriers

- **Available technology**: Swartz (1999) and Marwick (2001) suggest that technology is still unable to provide a single knowledge solution, and that an organization's codified solutions are usually a combination of cobbled-together applications.
- **Legacy systems**: Swartz (1999) identifies legacy systems as a significant barrier to knowledge management. Connecting the systems of multiple departments, especially when there is no common standard approach to IT deployment, makes it difficult to affect an efficient knowledge transfer system.

3. Organizational Barriers

- **Poor targeting of knowledge**: Scarborough *et al.* (1999) point out that "information needs to be targeted if it is to serve knowledge". Therefore, if a knowledge management system is to be effective it must be clear about what information it needs and what it expects to generate by way of knowledge.
- **Cost management of knowledge transfer**: Farr & Fisher (1992) point out that the cost of managing collaboration is a barrier to inter-organizational knowledge transfer.

- **Protection of proprietary knowledge**: Sharing proprietary information with collaborators leaves an organization open to the risk that the information will be revealed. The consequence of this belief is that resistance grows within an organization to sharing proprietary information with suppliers.
- **Distance**: According to Nonaka *et al.* (1995), the most efficient means of transferring knowledge is through face-to-face communications. However, the distributed nature of today's organization may make this difficult to do. Different cultural, legal, and linguistic environments can also impact this.

4. People Barriers

- **Internal resistance**: This is where knowledge is hidden or its flow is restricted in order to protect the interests of the organization.
- **Self-interest**: This is when customers may not be willing to provide information to a supplier for fear that the information will filter through to competitors.
- **Lack of trust**: Trust impacts the way we perceive received information and the value we place on it, and also the manner in which we share information. If an individual does not trust the recipient of the information to use it wisely, and in the best interests of the organization, this will affect how much information is passed between the individuals.
- **Risk**: Risk is related to both trust and proprietary knowledge barriers. Inter-organizational knowledge sharing inherently involves an element of risk, particularly when proprietary knowledge is being shared.
- **Fear of exploitation**: According to Lucas (2000), a fear of exploitation starts with the premise that "I will only share my knowledge with you if I think you can give me something in return". Although Barson *et al.* (2000) see this as a "people" barrier, the solution to resolving this problem is very much an organizational one.
- **Fear of contamination**: This barrier refers to when organizations with up-market brand issues are nervous about getting together with people they perceive as more down-market (Lucas, 2000).

There are also aspects of the research of Pawar *et al.* (2000), Kluge *et al.* (2001), and Szulanski (1996) that are not taken into account. Of particular interest is the impact that an imbalanced "push-pull" knowledge strategy can have on information flow and knowledge creation. Also, Szulanski's

work on identifying barriers which effect knowledge "stickiness" within an organization should be considered when assessing barriers in any large complex organization.

7.2.2 Barriers and the Learning Organization

These barriers to knowledge transfer will have an impact across all aspects of an organization's knowledge practice. Returning to Nonaka *et al.*'s (1995) **Learning Organization Model** (Figure 7.1), the knowledge barriers will manifest to a greater or lesser extent across all four quadrants of the model. It is important to note that whilst the barriers are unevenly distributed across the organizational learning model it does not mean that the barriers will always be present in these areas. What is important to note is that these barriers will impact the learning organization's ability to identify, create, and share information and knowledge. Therefore, a more accurate view of the learning spiral is shown in Figure 7.4.

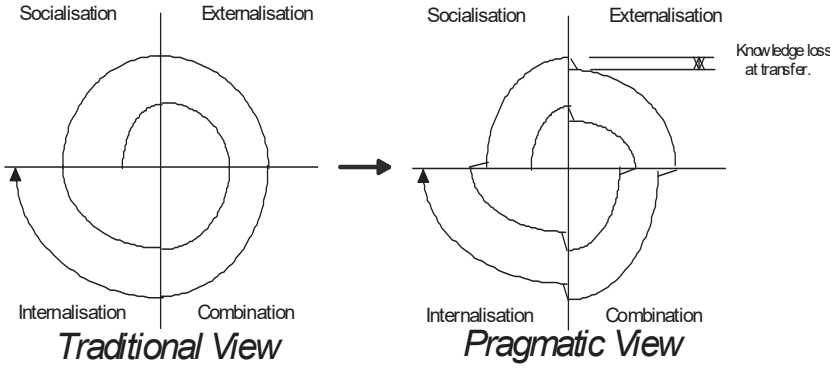

Figure 7.4: Knowledge Losses in the Learning Model (source: adapted from Nonaka *et al.,* 1995)

Figure 7.4 shows the traditional view as proposed by Nonaka *et al.* (1995) juxtaposed with a more pragmatic view showing the effect that the quadrant-related barriers might have on the learning process. The impact of the barriers (*knowledge loss at transfer*) will depend on whether the barriers exist, and to what level they are managed within the organization. Taking the pragmatic view a step further, if the barriers within the organization are allowed to impact knowledge creation and transfer without being identified

and managed, the learning spiral may conceivably collapse as shown in Figure 7.5.

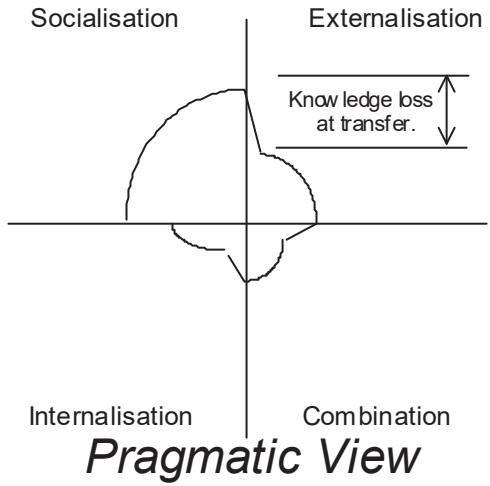

Figure 7.5: Knowledge Losses in the Learning Model (adapted from Nonaka *et al.,* 1995).

Figure 7.5 shows what can happen if the organization fails to manage the actions of unchecked barriers on its knowledge transfer. Barriers can and will impact to different degrees so the knowledge loss at transfer, as shown in Figure 7.5, will vary through the different quadrants. Therefore, organizations that simply see KM as the implementation of bigger and better IT systems are possibly only addressing barriers within the "combination" section of the learning model. If organizations are to stand a better chance of achieving their KM requirements they will need to identify and understand how the different barriers exist within their organization and impact the learning process across the four quadrants.

In effect, what this demonstrates is that the barriers themselves impact differently across the organization. This means that employees' information and knowledge creation and sharing practices will vary not only within the organization, but also along complex core process pathways. It is also important to note that an assessment of how barriers exist and impact along these processes would be expected to vary from organization to organization. How organizations create and share information and

knowledge is vitally important if an innovative, responsive business is to be developed. As core complex processes are the mechanisms by which business performance is driven, information and knowledge creation and sharing along these pathways must become a key focus point for business success. Therefore, barriers that impact along critical business processes must be understood and where possible, managed.

Another consideration this raises for organizations with complex business processes is that different barriers will need different solutions. How barriers impact the tacit-explicit-tacit transfer mechanisms along a process will determine the type of solution needed at that part of the process. Therefore, the deployment of a generic IT or business solution across the organization cannot now be expected to fully support the operational needs of employees along a complex process. For organizations to effectively manage their supply chains they must consider the operation of their core supply-chain processes. From this point, they should look to understand how employees create and share information and knowledge along this process and which barriers are seen to have impact. Only when this has been achieved can the organization effectively fine-tune the performance of the process through the removal or management of the relevant barriers.

Time Out

Think about it: Managing Barriers to Knowledge Transfer

Mapple Electronics is a successful manufacturer of MP3 music systems, with strong market penetration in both the North American and Asian markets. However, over the last six months competition has been growing in both markets. Whilst Mapple continues to develop and deliver high-quality products, their development time in introducing new products to the market is falling behind that of its competitors. Over the last few months Mapple has been beaten to the launch of three new products. This has resulted in the competition gaining a significant market share at the expense of Mapple.

The Senior Management Team has decided that the current new product life cycle needs to be drastically reduced from the existing 18 months to 8 months. A key focus point will be to develop closer collaboration between

the research and development groups in North America and Asia. Both groups have traditionally largely worked autonomously, with each group focused on a specific product line. Communication has been cordial, but both groups have tended to work in their own way, developing their own practices and processes to support their R+D efforts.

The board has asked Jean Rolland (CIO) to put in place the necessary systems to establish a closer level of cooperation between the two groups. Jean is not sure that this is simply a case of putting some IT systems in place, but Alexis Hoyt (CEO) seems to think that the success or failure to reach the new timeline for product release will be down to how good a job Jean does in bringing together the two R+D groups.

Thankfully, Jean has just completed an excellent course on technology enablement and remembers something about barriers to knowledge transfer. Jean knows that the success of the initiative will be based on how well the two groups engage and work together. Therefore, the transfer of tacit-to-tacit knowledge will be a significant component in generating new ideas and innovative ways of improving processes. As such, there are a number of barriers that will play a part in shaping the knowledge sharing practices between both groups. These are:

Existing resources
Rewards
Arduous relationship
Poor targeting of knowledge
Knowledge cost
Proprietary knowledge
Distance
Organizational context
Information not perceived as reliable
Lack of motivation
Internal resistance
Self-interest
Trust
Risk
Fear of exploitation
Lack of motivation
Fear of contamination

Lack of retentive capacity
Lack of absorptive capacity

After reviewing these barriers, it becomes clear to Jean that solving this problem is not simply down to the application of technology.

Questions:

- Do you think Alexis Hoyt (CEO) is right to make the CIO solely responsible for the improvement of new product development processes?
- How do you think technology can be used to reduce the impact of some, if not all of the barriers identified above?
- What do think the CIO should do to increase the chances of a successful outcome?

7.3. Using Technology to Support the Learning Organization

Wilson (2002) has highlighted the apparent view that knowledge management is reliant on technology as its primary enabler. The majority of the literature written about knowledge management still focuses on technology issues such as expert systems, artificial intelligence agents, collaborative software tools, etc. For a lot of KM practitioners, technology and knowledge are inextricably linked. Why is this? As stated already, there is a widespread view that information and knowledge are the same thing; a view that is helped in no small way by a continuing failure to collectively agree on what knowledge is.

Within a complex business environment, information is important in ensuring business decisions are made effectively and expediently. Businesses have made major investments in their IT/IS programmes and have come to rely heavily on their ability to capture, store, and manipulate real-time data. With the advent of knowledge management, coupled with the confusion concerning the subtle difference in meaning between "information" and "knowledge", many organizations simply continued their "information management" programmes under the new heading of "knowledge management". Within industry, many organizations received accolades for being "knowledge" organizations, when in fact they simply

had the best class information storage and retrieval systems. However, the term "knowledge management" started to lose its gleam as some organizations began to realise that investment in technology was not generating the rewards expected from the promised knowledge paradigm. Marwick (2001) looked at current technologies commonly used within knowledge management programmes and assessed them against the Nonaka *et al.* (1995) model for organizational knowledge creation. Marwick concluded that the automatic extraction of deep knowledge (tacit) from documentation (explicit) is still an elusive goal. Today, the level of automatic extraction is still shallow – only a subset of the meaning can be captured. As yet, there are also no systems that can reason in the sense of deducing something new from what is already known. Organizations were not getting what they thought they needed from KM. Right or wrong, KM was beginning to be thought of as faddish; the problem being that although many organizations spoke of knowledge management as the new management paradigm, they never actually made the paradigm shift.

As discussed within this chapter, both key types of knowledge (tacit and explicit) must be considered for any knowledge management initiative to succeed. According to Johannessen *et al.* (2001), there is a real danger that as the main focus of IT/IS solutions is on explicit knowledge, tacit knowledge may be relegated to the background, hence leading to a knowledge mismatch. This has been seen to happen within many organizations. However, the level of impact varies. This is down to how the respective organization uses knowledge and information. If an innovative, empowered, organic culture is required, then organizations need to focus on tacit knowledge creation and transfer. If, however, a more mechanistic, controlling culture is required then tacit knowledge may not be as important as explicit knowledge. Hence, a successful KM implementation in one organization may not be considered a successful KM implementation in another.

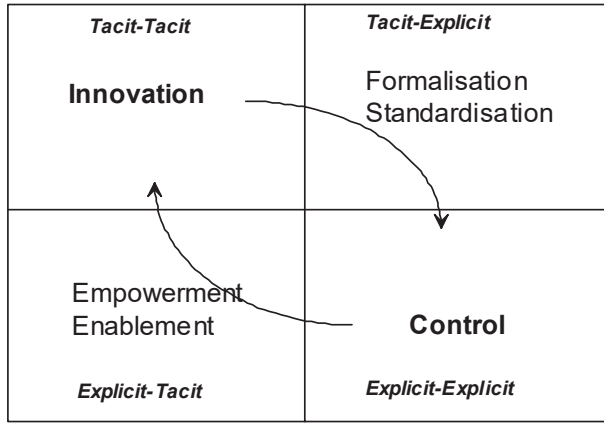

Figure 7.6: Impact of Knowledge Focus (source: McLaughlin, 2007)

Figure 7.6 is used to demonstrate this point. If an organization concentrates on explicit-to-explicit transfer then codified processes will be used to ensure that information is captured, stored, and disseminated as and when required. The emphasis, if tacit knowledge is not considered, will be on information control. If, however, the organization needs to be innovative it must focus on developing its workforce to create knowledge in the form of innovative ideas. Historically, most organizations have focused on the control aspect of knowledge management. This is quite suitable if it is what the business demands. However, if the business demands innovative thinking then a failure to focus on the development of tacit knowledge creation will leave the organization with an underperforming knowledge implementation strategy. Therefore, in order to get the most out of any knowledge management system the creation of new, innovative knowledge must be considered. This aspect is what really underlines the paradigm shift, as to focus on tacit knowledge creation one must look to people management techniques and not information management techniques as the key-enabling factor. Also now consider the fact that complex supply-chain organizations will have different knowledge and information requirements across the organization. Development, marketing, and sales will require a higher degree of individual innovative knowledge creation than say, distribution or manufacturing. The point here is that the knowledge focus will not be uniform across the supply chain. Therefore, for an organization to get the most out of its knowledge strategy it must consider the separate and distinct

needs of its knowledge stakeholders. The question now is how does the organization harness the individual's knowledge needs for the benefit of the organization?

When an organization adopts an approach to "total" supply-chain management, work practices have to change. Employees start to get things done through the formation of cross-functional teams or cross-departmental project teams, or even joint customer-supplier teams (van Weele, 2002). In order for employees to work effectively in such complex environments, innovation and peer-to-peer collaboration become a necessary part of driving overall performance. Within an environment where innovation and peer-to-peer collaboration become vital to the success of the organization, the manner in which information and knowledge are accessed, created and shared within the organization becomes a fundamental component ensuring effective collaboration and innovation.

7.3.1 Supporting Knowledge Transfer across Complex Supply Chains

Collaboration and innovation must be encouraged within a complex environment where organizational process alignment is prioritised over functional alignment. Now also consider the importance of information and knowledge flows to organizational performance. What this points to, with respect to complex supply chains, is the importance of effective information and knowledge flows along core supply-chain processes. Many knowledge and information management initiatives focus on organization-wide, business-function-specific, or technological implementation (Kluge *et al.,* 2001). However, for optimal supply-chain operation the focus needs to be on the actual processes. As the processes can cross multiple organizational boundaries, reliance on technological solutions alone cannot be wholly depended on (Kluge *et al.,* 2001; Marwick, 2001).

However, before moving on, one should consider variation between supply chains, and how this might impact knowledge initiatives. Lin *et al.* (2002) looked at knowledge management architecture in collaborative supply chains and highlighted the following findings. In supply chains where product innovation and change are a constant requirement (design-centric industries), the knowledge flows are usually informally structured with the emphasis on knowledge creation and transfer (tacit knowledge generation using personalised systems). In supply chains where product volume and structure are required (product-centric industries) the knowledge flows are

usually more formally defined with the emphasis on knowledge capture and transfer (explicit knowledge storage using codified systems). The knowledge focus will change depending on the type of product/service being delivered through the supply chain. However, Lin *et al.* (2002) make their assumptions for knowledge practice across the whole supply chain. It is also important to consider the complex operating relationships between business components, and, therefore, the varying knowledge creation and sharing needs and habits of the supply chain at an operational level.

Yuva (2002) also looks at knowledge and the supply chain from a top-level, organization-wide perspective. However, Yuva (2002) identifies five characteristics inherent to supply-chain organizations with successful knowledge management models. These are:

1. **Awareness of the knowledge and skills of others**: How to get the skills mix right across the supply chain.

2. **Time and space to create, share, and apply knowledge**: Supply managers must be able to respond to the questions of other employees and suppliers.

3. **Trust**: Does it exist within the organization? Who should/needs to trust whom, and how can this be encouraged?

4. **Common language of understanding**: Without a common agreement on vocabulary and background context it is difficult to apply knowledge from one part of the organization to another.

5. **Recognition mechanisms**: For those actively contributing their knowledge.

Although Yuva (2002) does not explicitly identify the criteria for assessing the knowledge capability of a supply chain, it is interesting to see that the characteristics focus on the "softer" aspects of knowledge management. The focus is on the generation and sharing of knowledge, not just on its capture and storage.

7.3.2 Different Technology for Different Requirements

Although technology is currently better placed to manage explicit knowledge, there are ways that it can still support the creation and sharing of tacit knowledge. Technology is advancing at a fast rate, with new software and systems coming on line that may have the potential to improve an organization's ability to manage its tacit knowledge assets. With considerable focus now being placed on how un-structured data are collected, analysed and managed, organizations are getting better at sifting through, and making sense of syntactic and semantic information.

However, despite advancements in artificial intelligence, processing capabilities, and data analysis, technology is still largely focused on manipulating the data once they are already in the system. As can be seen from the barriers to tacit-to-tacit knowledge transfer, the main problem is getting individuals to engage with one another, and trust each other with their knowledge. Table 7.4 looks at the different types of knowledge transfer and shows how current technologies are being used to reduce knowledge loss across the knowledge boundaries.

Knowledge Transfer	Main Focus/Behaviour	Technology	Examples
Tacit to Tacit	Innovation	Team rooms, Wikis, Collaboration technologies	Lotus Notes, Skype, Lync, Instant messaging, email, VoIP, PMwiki.
Tacit to Explicit	Standardisation/ Formalisation	Fulfilment Systems, Financial systems, Business control systems	SAP Order management, Salesforce.com, Sage, Oracle.
Explicit to Explicit	Control	ERP, Warehouse management systems, Logistics tracking systems.	Oracle Fusion, i2, DB2, mySAP, PeopleSoft, RFID.
Explicit to Tacit	Empowerment/ Enablement	Dashboards, Data visualisation	Tableau, SAS, SPSS, Crystal Reports.

Table 7.4: Technology and Knowledge Transfer Mechanisms

Many organizations, due to the unique way in which they need to manage their knowledge assets, find that commercially available information management systems need to be customised before they can be fully integrated into the business. This process of customisation can represent a significant challenge for most organizations, as the costs incurred can be substantial. Therefore, it is imperative that the organization's priority for knowledge transfer is understood before the decision is made to invest in an enterprise-wide information system.

A very high-level view of how technology can be aligned to support the four knowledge transfer mechanisms can be expressed as follows:

- **Tacit to tacit**: Person to person. The need to focus on how individuals work together, build relationships, and trust each other.

- **Tacit to explicit**: Person to system. The need to focus on how individuals use and trust systems. Also, how systems can capture context-sensitive information.

- **Explicit to explicit**: System to system. The need to focus on how systems store, access, and transfer information.

- **Explicit to tacit**: System to person. The need to focus on how systems present information, and how individuals access and understand system-generated information.

Table 7.5 shows there are technologies that look to support collaborative information and knowledge sharing across a distributed workforce. A more common term for these technologies is **Groupware**. It is believed that the use of groupware in the working environment can help to create a **collaborative working environment**, or CWE. These are designed to support workers in the successful completion of their individual and group tasks through the establishment of networked links to team members, other relevant workers and subject matter experts.

However, there is a key consideration to be made when selecting groupware systems. As discussed already, every organization will have different information and knowledge sharing practices. Therefore, "off the shelf" solutions will need to be modified and fine-tuned in order to ensure they support the sharing practices. Many groupware providers are working to resolve this complexity issue, but this is causing many systems to evolve

into larger, more complex systems, which in turn can be over engineered in terms of functionality, and be difficult to use or connect with.

In effect, groupware can be divided into three levels of collaboration:

Level of Collaboration	Description	Technology Example
Communication	An unstructured exchange of information.	Email, voice mail, wikis, faxing, and websites.
Collaboration/Conferencing	Supporting interactive team working on shared tasks and goals.	Instant messaging, internet forums, team rooms, application sharing, video conferencing, and telephony systems.
Coordination	Supporting more complex interdependent work towards shared goals.	Shared calendars, workflow systems, social media, and knowledge management systems.

Table 7.5: Levels of Groupware Collaboration

Groupware solutions will tend to focus on the different levels of collaboration in different ways, all of which are trying to distinguish themselves by providing something different and relevant to organizations looking to develop their knowledge management capabilities. Therefore, when selecting a groupware solution, it is important that the organization understands what aspects or level of collaboration is required.

7.3.3 Selecting the Right Knowledge Management Initiatives

Once a system designed to improve knowledge management has been decided on; the question is how do we know if the improvements will result in overall performance improvement? In order to stand any chance of understanding this we need to define the key attributes of performance. These will surely change depending on the nature of the organization's business. For example, a "not for profit" organization will not have profit as a key performance indicator. Therefore, depending on the business objectives, the performance indicators will vary. From this, the knowledge focus will also vary. So, should organizations develop organization-wide knowledge management initiatives that focus on developing and encouraging a "push-pull" culture? Or should organizations focus their limited resources on identifying and implementing KM initiatives around core performance indicators?

The answer, as expected, is "it depends". The question posed basically relates to two ends of a spectrum. Organizations need to focus on knowledge initiatives from a corporate-wide perspective, such as developing a "push-pull" culture. However, resources within any organization will be limited. Therefore, organizations must focus their knowledge initiatives in those areas that can directly improve performance. Some might say that the easy solution is to focus on organization-wide knowledge initiatives that also focus on the top-level performance drivers. In this way the organization's knowledge initiative can be developed and driven from the boardroom. However, focusing on top-level performance drivers might not be as practical as one might think.

If an organization uses its top-level performance indicators to direct knowledge management initiatives the emphasis on knowledge type (tacit v. explicit), culture (pull v. push), and/or implementation (codified v. personalised) might be wrong. As shown, top-level performance indicators are just that. In complex organizations different functions or business units may have more, or less, impact on different indicators. Therefore, knowledge initiatives need to focus on the actual performance mechanism operating within and across the different functions or business units.

From a complex process perspective this means developing certain aspects of the knowledge strategy directly around the information and knowledge needs of the core business process. From a practical perspective, even before considering the motivation, trust, and causal ambiguity issues that shape the knowledge practices of employees, there must be a clear understanding of how the core process links throughout the organization.

Time Out

Think about it: Supporting Knowledge Transfer

The Integrated Research Institute (IRI) has been set up by your government to help develop the national research agenda. It is your government's intention that a stronger, more collaborative research network will generate additional research funding for the country, and increase foreign investment. At present, universities or small commercial research bodies carry out most of the scientific research. Because of this there is no real collaboration between the research entities. Therefore, critical experience and expertise are not being shared effectively between the research teams.

The government has set up IRI to establish an effective collaborative network between the different research teams in order to share knowledge and information. By bringing the researcher teams closer together the government feels that this will improve the chances of bringing more international funding into the country, and building a strong international reputation around research.

Jacque Noir is the director of the newly established IRI and has asked you to come in and help to establish the systems necessary to build a knowledge and information sharing network. There are currently no systems in place to support any form of collaborative network between the different research groups or teams. Jacque and his director of IT (Serge Yorminski) have already had a few "ideas" about what is needed. Serge thinks a groupware solution such as IBM's Lotus Notes or Microsoft's SharePoint will do the job. Both are effective software technologies focused on supporting a collaborative networked environment, and the belief is that this type of "off the shelf" solution would be a quick and cost-effective answer to the problem. Jacque and Serge believe that once a common collaborative platform is established, information and knowledge sharing will flow between the different research teams on the network.

In a sense, Jacque and Serge have a point. Something needs to be put in place quickly to get the network up and running, and the government is looking for signs of progress. However, you are a little concerned that IRI is rushing towards a technology solution without considering the subtle

differences between knowledge and information. Should the establishment of a network be simply seen as a technology issue? Is there more to consider when linking researchers in what is a highly competitive funding environment?

Questions:

- Do you think Jacque and Serge are right to think of the solution to the establishment of a collaborative network as being largely technical?
- If you think of the network as a mechanism for sharing information, or a mechanism for sharing knowledge do you get two different network solutions?
- What other considerations should Jacque think of when building a knowledge-sharing network? Is access to a common collaborative network the only thing that will influence how knowledge and information are shared?

7.4. Knowledge and Innovation

For any business to survive and compete in today's globally competitive market place, the concept of knowledge creation and transfer must be understood and embraced across the organization. In the case of organizations where driving innovation is vital to the success of the business, the development and implementation of an effective knowledge management strategy are an absolute necessity.

However, how many of these knowledge management initiatives are actually working? How can an organization know if it's got the right balance between technology and social connectivity across its organization? Unfortunately, a lot of organizations fall foul of the common mistake that information and knowledge are the same thing, and therefore, their information systems can easily be upgraded to knowledge systems. Information can be seen as the result of processing, manipulating and organising data in a way that adds to the knowledge of the receiver.

7.4.1 Knowledge Usage Patterns

In organizations that are based on a "process" type workflow, information systems can support the knowledge needs of the majority of workers. However, in organizations that are predominantly "project" driven, such as engineering consultancies where unique and bespoke solutions are required to resolve client issues, a heavy dependence on IT can be counter-productive in encouraging knowledge creation and transfer, which in turn may drive innovation. Often, people are not aware of the knowledge they possess or how it can be valuable to others. Tacit knowledge is considered more valuable because it provides context for people, places, ideas, and experiences. The effective transfer of tacit knowledge generally requires extensive personal contact and trust. On the other hand, explicit knowledge has been or can be articulated, codified, and stored in certain media. It can be readily transmitted to others. The most common forms of explicit knowledge are manuals, documents and procedures.

Tacit knowledge is by far the knowledge component that is harder to identify and manage, whereas, explicit knowledge is easily identified and managed through IT systems. However, from the definitions provided it can be seen that organizations dependent on developing an innovative culture must not neglect their tacit knowledge components. Once again, Nonaka's learning organization model can be used to highlight how focusing on the way knowledge is created and shared can shape how an organization's knowledge strategy works to support or restrict its knowledge/innovation needs.

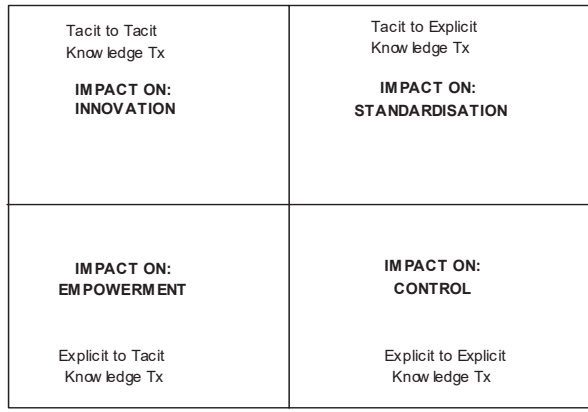

Figure 7.7: Nonaka's Learning Organization Model

Figure 7.7 shows that an organization that focuses on any one aspect of knowledge transfer over the others will reduce its ability to learn. Certainly, most organizations will need to consider all aspects of knowledge transfer across their respective business groups. However, if you're a consultancy firm that is about to invest heavily in IT systems that focus on explicit-to-explicit transfer then don't be surprised if you don't see a significant increase in innovation. Conversely, if you're a call centre that is about to invest in people-centric organizational changes you'll need to make sure you still maintain control of your data in standardised formats. Figure 7.7 also outlines the dominant effect that the type of knowledge transfer will have. For example, tacit-to-tacit knowledge transfer, if effective, will have a positive impact on innovation, whereas explicit-to-explicit knowledge transfer will provide better control over the storage and dissemination of, and access to information.

7.4.2 Different Knowledge Transfer Profiles

Another key consideration is that certain parts of your organization will have different knowledge transfer profiles and, therefore, will require a different knowledge focus. Again, in developing a learning, knowledge-sharing environment, organizations need to consider all aspects of knowledge transfer. However, certain transfer mechanisms will have precedence. For example, consultants working on a design project will need support for all four knowledge transfer mechanisms, but the main focus must be on tacit-to-tacit knowledge transfer if innovation is be encouraged. In the case of a manufacturing process the emphasis will need to be on explicit-to-explicit transfer. The use of codified IT systems will be important in controlling the core manufacturing processes.

Therefore, before embarking on a knowledge management initiative, organizations should ask themselves what they are trying to achieve. What is the effect they are trying to create within the organization? By doing this organizations will be forced to look at the different knowledge transfer mechanisms across the organization, and will therefore, better understand the impact that the main focus of their knowledge management imitative will have on their ability to create the desired effect.

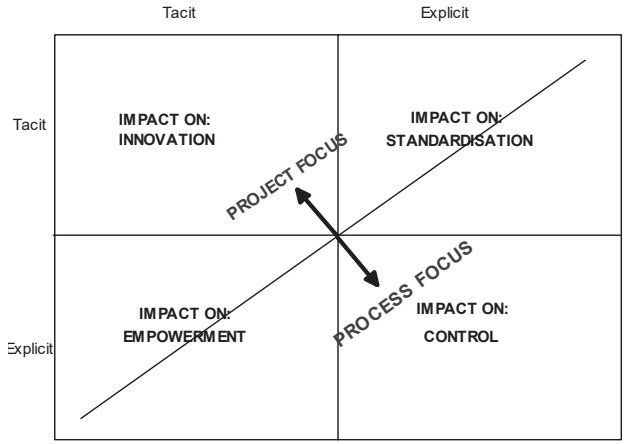

Figure 7.8: Project v. Process Focus (McLaughlin, 2006)

It's important to note that all organizations will have a need for empowerment, control, standardisation, and innovation when considering their knowledge management system, and any one is as relevant as any other in terms of overall business performance (Table 7.6).

Knowledge Transfer Mechanism	Desired Outcome	Impact
Tacit to Tacit	**Innovation**	Creative thinking, cross-organizational team working, improved team working, and the generation of new knowledge.
Tacit to Explicit	**Standardisation**	Standardisation of data formats, common understanding of presented information.
Explicit to Explicit	**Control**	Dissemination of information across organization. Better (Centralised) decision-making based on accessible information. Improved access and control of information. Data manipulation.

Explicit to Tacit	**Empowerment**	Better real-time (distributed) decision-making based on accessible information. Improved data analysis.

Table 7.6: Impact of Knowledge Transfer

It is important that the organization is focused on the right aspect of knowledge management. Figure 7.9 shows how different aspects of an organization might require a different knowledge management focus. The relative positions of the business functions will differ from business to business based on the product offering, delivery, the customer set, the size of organization, the skills profile of employees, etc. However, the point to note is that organizations need to view their knowledge needs at discrete points across the organization, and not assume that the way knowledge is created and transferred across the organization will be the same.

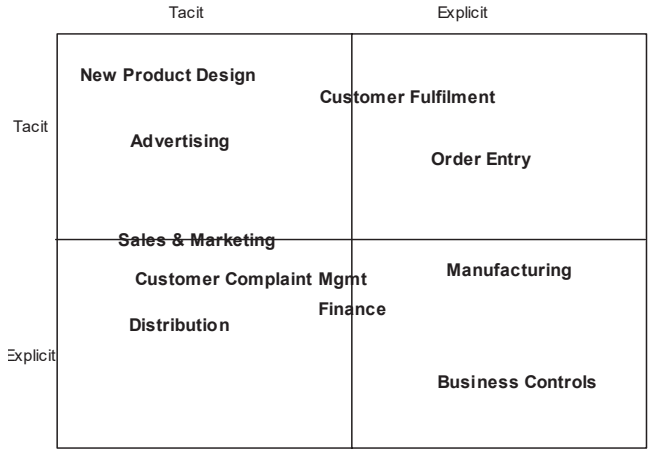

Figure 7.9: Knowledge Transfer across the Enterprise

Correctly matching an organization's knowledge management strategy to its actual knowledge creation and sharing needs, requires an understanding of the different knowledge habits of its employees. This requires more than a basic understanding of the latest IT technology. Organizations must realise that, certainly for innovation to flourish, tacit-to-tacit knowledge transfer must be encouraged, and whilst the availability of IT will help facilitate this, it does not necessarily encourage it.

So, in an environment where resources are limited, organizations will want to ensure that investment in knowledge management is directed at the right projects. Unfortunately, a lot of organizations tend to focus on managing either tacit or explicit knowledge as separate entities, and not on managing the actual transfer mechanism between these two types of knowledge. As shown in Table 7.7, codified or personalised systems can be used for managing all four types of transfer mechanism. However, if an organization does not fully consider its knowledge needs, choosing the wrong system to manage their knowledge transfer mechanisms may result in the wrong desired effect. For example, if an organization needs to develop its tacit-to-explicit transfer, and realises the reason for poor transfer is due to a lack of employee technical awareness, then concentrating on providing IT training (a personalised systems approach) will have a better impact then concentrating on upgrading the technology being used (a codified systems approach).

Knowledge Mechanisms	Solution Approach	Variation in Impact
Tacit to Tacit (Focus on Innovation)	*Codified System*	Implementing changes that enable better face-to-face interaction through the use of technology and available systems.
	Personalised System	Implementing changes that allow better face-to-face/ information sharing through formal/informal network development.
Tacit to Explicit (Focus on Standardisation)	*Codified System*	Implementing changes that improve the capture of information through improved systems interfaces.
	Personalised System	Implementing changes that improve an individual's ability to input valuable information into appropriate systems.
Explicit to Explicit (Focus on Control)	*Codified System*	Implementing changes that improve system-to-system data transfer.
	Personalised System	Implementing changes that look to improve how information is manually pulled from systems, reformatted, and then re-entered to different systems.

Explicit to Tacit (Focus on Empowerment)	*Codified System*	Implementing changes that look at improving the way systems present information in a format acceptable to the user.
	Personalised System	Implementing changes that look to improve users' contextual understanding of the information on systems, and their ability to analyse the said information.

Table 7.7: Knowledge Mechanisms and their Various Types of Impact

In a complex business it can be difficult to focus on what actually matters, and which aspects of knowledge management should be focused on. Therefore, the following points should be considered when deciding on a suitable knowledge management strategy.

1. **Don't think in terms of technology – think in terms of the desired outcome**: Think in terms of what you are trying to achieve: control, empowerment, standardisation, and/or innovation. Thinking of your knowledge requirements in these terms will help you direct your knowledge initiatives in a way that is better matched to your knowledge needs.

2. **Desired outcomes will require different knowledge management approaches**: Certainly, a knowledge initiative focused on developing better control will depend more heavily on ICT systems than an initiative focused on innovation. In the case of innovation any knowledge initiative must not only centre on connecting key people, but also on getting them to share their ideas. This aspect of knowledge creation and sharing may require more organizational and cultural change, as opposed to technological change.

3. **Knowledge needs will vary across the organization**: People, teams, and departments throughout the organization will have different knowledge requirements based largely on their skills profile, professional status, and job definition. Therefore, applying a generic knowledge management approach across the organization will produce an inefficient knowledge management system that is not focused on driving performance respective to the different business functions that in turn make up the organization.

4. **Knowledge creation and sharing are human functions**: Effective knowledge storage, dissemination, and retrieval are certainly improved through the implementation of IT systems. However, knowledge creation and sharing are very dependent on softer aspects of knowledge management such as trust, training, incentive to share, personal experience, and inter-personal, inter-team relationships. The management of these aspects (only a few are mentioned here) is not dependent on effective IT systems, but on the successful implementation of organizational and cultural change initiatives.

These four points are not a prescriptive template for designing an organization's actual knowledge management system. However, they should be used to help ensure that the reason for developing a knowledge management system and the approach used in its implementation are focused on matching the right knowledge management techniques to driving the desired knowledge outcomes across the business. After all, resources are limited and to be competitive organizations must ensure that their knowledge management systems fully support the knowledge needs of the different parts of their business.

7.4.3 Linking Knowledge to Innovation

Innovation is very much based on tacit-to-tacit knowledge exchange (Nonaka *et al.,* 2003). Therefore, organizations must not only think about how to connect individuals but also how to motivate them to share information and knowledge in a productive manner. An important point to remember about innovation is:

"Innovation is an 'Act of Will' as opposed to an 'Act of Intellect'."
(Schumpeter, 1962).

This basically points to the fact that having the intellect to solve problems and create unique and innovative solutions is not enough. Also, individuals have to want to engage in the process of solving problems and creating innovative solutions. Pavitt (2006) identifies three broad overlapping sub-processes of innovation. These three sub-processes are not consecutive steps, but they do need to be evident for organizations to translate knowledge into innovation. The three processes are:

1. **Production of knowledge**: The organization needs to produce and share knowledge across its internal and external boundaries.
2. **Transformation of knowledge into artefacts**: The organization must be able to turn its knowledge into products and/or services.
3. **Continuous matching**: For the knowledge and innovation to be relevant the organization must continue to align its output to the market needs and demands. Failure to do so will result in products and services that are not relevant to the market.

The link between creating knowledge and delivering products and services that are aligned to customer needs allows for the differentiation of knowledge and **performance related knowledge**. Not all knowledge created within an organization may be relevant to driving performance. Therefore, once again the organization must understand about:

- **Knowledge focus**: What will be the focus of knowledge required to drive competitive performance? (New product development, manufacturing quality, customer insight, financial management, design, etc.)
- **Knowledge Type**: What will the knowledge look like (tacit or explicit), and how will this differ across the organization?
- **Knowledge Transfer**: How will knowledge be moved around the organization? Information systems are best positioned to handle explicit-to-explicit knowledge transfer, but what about tacit-to-tacit, tacit-to-explicit, and tacit-to-explicit knowledge transfer?
- **Knowledge outcome**: What types of decisions will employees be able to make based on their access to information and knowledge?

Therefore, it is important that organizations use technology not just to improve access to information and data, but also to improve the ability to create and share knowledge that is focused on improving organizational performance. Most organizations tend to focus on those aspects of information and knowledge that are:

- Explicit and measurable in nature.
- More concerned with capture and flow, than creation and sharing.
- More related to “control” than “support” of the business function.

As we know, these functions are still important to the overall performance of the organization. However, they alone will not help to develop a sustainable, competitive and innovative organization. It is important to have

an information system that is focused on the collection, formatting, storage, and analysis of data and information, but this does little to support or enable the creation and sharing of tacit knowledge, which in turn is the core enabler for innovation.

Rothwell (1992) took further Schumpeter's view of innovation as an "act of will" by identifying the link between successful innovation and the degree of collaboration between the different components of an organization. Rothwell (1992) basically stated that for innovation to flourish the most important factor differentiating successful from unsuccessful innovation has been the degree of collaboration between those responsible for product development and delivery. This returns to the need to get individuals talking, working together and trusting each other.

Davenport (1994) developed the concept of the human-centred information management structure. The intent was to put the "human" back at the centre of the organization's view of its information system development. Any information system is only as good as the information that flows through it. If employees are not engaged in creating and sharing information and knowledge then the information and data will hold little value to the organization. Davenport's structure (Table 7.8) places the individual at the core of any system designed to drive value through information and knowledge sharing.

Information Architecture (IA)	Human-centred Approach (HCA)
Focus on computerised data.	Focus on broad information types.
Emphasise information provision.	Emphasise information use and sharing.
Assume the permanence of a solution.	Assume the transience of solutions.
Assume single meaning terms.	Assume multiple meaning terms.
Stop when the design is done or the system is built.	Continue until the desired behaviour is achieved enterprise wide.
Build enterprise-wide structures.	Build point-specific structures.
Assume compliance with policies.	Assume compliance is gained over time through influence.
Control user information.	Let individuals design their own information environments.

Table 7.8: Human-centred Information Management (Davenport, 1994)

This structure represents a spectrum with information architecture (IA) at one end and the human-centred approach (HCA) at the other. The IA approach looks at how information can be captured, manipulated, stored, and accessed, whereas the HCA looks at how humans interact with each other for the purposes of sharing and accessing information and knowledge. Therefore, when considering the knowledge requirements for an organization the following considerations need to be taken into account:

- Effective knowledge management is not just about technology. Don't let technology dictate how you implement knowledge transfer mechanisms.
- Organizations must understand and influence how employee's access, share, and create information.
- Organizations need to understand how their structures support knowledge transfer.
- What is the priority? Concentrating on capturing information or connecting knowledge workers?
- How will the dynamic operating environment impact the currency of information and knowledge?
- Does the knowledge strategy support the overall business strategy?
- One person's knowledge is not always another person's knowledge… how do you reconcile this? (Managing the environment.)

These are some of the challenges that every management team will face in developing and managing a knowledge-aware organization. Technology will certainly play a significant role in how information and data flow around the organization. However, serious consideration must also be given to how engaged and motivated individuals are at creating, sharing, and acting on information and knowledge for the good of the organization.

Time Out

Think about it: Outsourcing Business Capabilities

Diamond Manufacturing Ltd. (DML) has been a market leader in the manufacturing of domestic ovens for over forty years. However, with the recent rise in the number of global competitors trying to service the same market DML has been noticing its market share being steadily eroded. Elizabeth Shaw (CEO) knows that they are getting into a price war

with the competition. Fortunately, Elizabeth also knows that this is a war that DML cannot win. Many of DML's overseas competitors can build and ship their products for less due to lower labour costs. Hence, Elizabeth and the Senior Management Team (SMT) don't want to get into this type of competitive war if they can avoid it. The SMT would prefer to separate DML from the competition by rebranding their products as innovative, high-quality products to suit a successful lifestyle.

Martin Dwyer, Head of Marketing, is keen to lead the re-branding initiative. Elizabeth has asked Martin Dwyer, Tomas Huff (Sales Director), Alan Ricker (R+D), and Ricki Morales (Head of Manufacturing) to identify how best to re-brand their core products, and get the organization structurally aligned to support the new business models. Elizabeth wants to support the expected high consumer price with a personalised experience for each customer, where they can modify their product of choice in a way that best suits their lifestyle (or kitchen). Part of the new development process will be to include customers all the way through the development and manufacturing processes; thus ensuring the finished product is actually what the customer expects.

Whilst the plan will be to offer a premium product at a premium price the organization will still be focused on taking as much cost as possible out of the manufacturing and supporting processes.

Elizabeth and the other managers involved in the re-branding initiative do not see any major changes to the core supply-chain processes and, therefore, do not see any major changes to the current technology and information systems.

In effect, the team managing the re-branding sees the following changes happening across the organization:

- **R+D**: Developing a collaborative and innovative partnership with customers to ensure products are built to the customers' level of expectation, and not just DML's level of expectation.
- **Manufacturing**: Improve the turn-around time to build and ship customised products. Processes will need to be optimised to ensure, where possible, that the cost is minimised.
- **Marketing**: The marketing team needs to properly identify an acceptable price point based on the new product offering. The team

will also need to get better at analysing the markets, targeting, segmentation, and the positioning of products.

- **Sales**: The sales team will need to reconsider its channel strategies, and whom they want to partner with in order to develop the brand. They will also need to develop a capability to directly engage with the customer. Prior to this, all DML products were sold through a channel partner with little or no direct customer contact.

Because of this prevailing view amongst the management team, Sasha Strauss (Head of IT) is providing a supporting role though the re-branding process. Elizabeth is keen to keep the re-branding team as small as possible as she feels the more people involved, the slower will be the process of change due to the need to get consensus amongst the team members. However, is Elizabeth right to exclude the Head of IT from this process?

Questions:

- Do you think the new re-branding initiative will change the nature of the type of information and the way that information and knowledge are accessed and shared across the organization?
- Should the Head of IT play a more integral role in the re-branding exercise, and what value do you think the Head of IT can bring to the team?
- How can technology help to support the changes in R+D, Manufacturing, Sales, and Marketing, and does it make any difference if the focus is on information or knowledge?

7.5. Learning Summary

The term “knowledge” is often confused with “information”. Due to the continued misuse of these terms “knowledge management” has for many organizations simply become an extension of “information management”. This has resulted in an overemphasis on technology as the main enabler of knowledge management. This technology-centric view has resulted in many knowledge management initiatives developing as

predominantly explicit knowledge, or more accurately, information management systems.

Knowledge can be broken down into two main components: tacit and explicit. Tacit refers to "hidden" or cognitive knowledge that shapes our understanding and beliefs, whereas explicit refers to documented knowledge – which is sometimes more broadly referred to as information. The failure to consider the importance of tacit knowledge in the process of knowledge creation is aided in no small way by the intangible abstract nature of tacit knowledge. If organizations are to improve their employees' ability to create new knowledge and then explicitly communicate this knowledge, they need to consider both tacit and explicit forms of knowledge. The importance of tacit knowledge is significant to any knowledge management initiative that looks to generate new innovative ideas. However, the nature of tacit knowledge makes it difficult to manage solely through the use of technology. That said, organizations that ignore the importance of tacit knowledge will fail to enable their innovative capability through collaborative knowledge sharing.

How organizations use "knowledge" and "information" will determine how they balance their focus on knowledge initiatives between tacit and explicit knowledge forms. Organizations which depend more on command and control may opt for a more "explicit" focus to their knowledge initiatives, whereas organizations that depend on continuous innovation will need to focus on tacit knowledge creation and sharing in their knowledge initiatives. The reality is that most organizations will have a mix of innovation and control requirements.

Considering the complex nature of today's supply chains and networks, organizations need to match their knowledge strategies to different parts of the supply chain as the shift between innovation and control will vary. If one accepts this view then the deployment of organization-wide knowledge and information strategies is not an effective approach to knowledge strategy implementation. Because of this, organizations need to understand how knowledge and information creation and sharing happen all along their core processes.

The Nonaka *et al.* (1995) learning organization model provides a good starting point for understanding the relationship between tacit and explicit knowledge transfer. However, one needs to be aware that knowledge loss will happen across this process. If organizations concentrate on explicit-to-explicit transfer (*combination*), knowledge loss across the other three key stages could go unchecked. As the direct control of tacit knowledge is not

practical due to the impossibility of directly managing what individuals think, in order to try and reduce the amount of knowledge lost across the four stages the focus is not placed on how knowledge is created, but on identifying the actual barriers to knowledge transfer between *socialisation, internalisation, combination*, and *externalisation*. By identifying the barriers to knowledge transfer, the organization can better understand the knowledge creation and sharing habits of its employees. Therefore, by managing these barriers the knowledge environment can be shaped to provide a more conducive atmosphere for the development of either tacit or explicit knowledge – depending on the organization's knowledge needs. Technology can then be introduced to support the management of the identified knowledge barriers.

Finally, when considering a knowledge strategy, the assessment of a suitable approach tends to look at the organization as a whole. Organizations embarking on a knowledge management programme will tend to deploy a codified (systems driven) or personalised (team driven) dominant strategy. The problem is that such approaches are usually deployed at an organization-wide level with little consideration for how knowledge is actually created, shared, and accessed in different parts of the organization. When considering the complex knowledge creation and sharing needs along a supply chain a different approach is needed for developing an appropriate knowledge strategy.

7.6. Case Study – Managing Knowledge Across a Complex Supply Chain

As organizations start to compete within global market places, the complexity of their supply chains increases significantly. In order to address and manage the increased complexity many organizations look to enterprise "supply chain" software solutions to ensure a smooth scalable supply-chain operation. This was the case with IBM's Integrated Supply Chain (ISC) operation in their Europe, Middle East and Africa (EMEA) region. Recent strategy initiatives had seen manufacturing and distribution for PC products handed over to third-party providers. As part of the partnership agreement the manufacturing and logistics partners shared, or had access to IBM data feeds thus enabling a continuous data flow from the IBM-handled fulfilment front end through to the third-party distribution engine. The data flowed; however, end-to-end performance began to deteriorate significantly. Whilst developing a recovery plan the

organization identified the fact that the performance issues were down to a failure to understand how employees, situated in different parts of the supply chain accessed, created, and shared information and knowledge. What this case study will do is show how knowledge and information needed to be accessed, created, and shared, and how the recovery plan, by focusing on the identified preferred knowledge and information needs at different points across the supply chain, was able to drive significant end-to-end core process improvements.

The core IBM supply-chain processes are supported by integrated information systems such as SAP, i2, and IBM's own DB2 database system. Certainly, information in the form of performance data was available at all points across the supply chain. However, core performance, in the case of IBM, was under target. In this case, the key performance metric was the time taken to process, build and deliver a customer's order. IBM was quick to apply a resource and executive focus to address the problem. However, if a sustainable process improvement was to be achieved a different approach would be needed to identify where best to implement performance-improving change. The first issue the organization faced in improving performance was to identify and separate the real problems from the apparent problematic symptoms. In order to do this an end-to-end process description would need to be developed for the supply chain. This would be a significant undertaking, and not practical considering the time pressure and resource constraints. Therefore, it was decided that a process description would be defined for the core business process responsible for customer order delivery times; this was the Order Flow Process (OFP).

As information and data were available across the process, the management team would look at how both information and knowledge were being used along the core order flow process (OFP). In order to do this along with defining the OFP, the management team would also have to identify the key employee groups that operated along the OFP, and then determine their information and knowledge habits. By then looking at how the employee groups are constrained in their information and knowledge habits (by organization, technology, and people), and comparing this to how the employee groups would like to work, a list of information and knowledge related performance improvements could be identified.

The identified employees involved with the OFP belong to the eight distinct workgroups.

OFP Groups	Description
OR–OE	*Primarily responsible for order receipt and loading activities, and ensuring customer orders are valid prior to loading.*
OE–OD	*Primarily responsible for supply availability against order forecast/expectation, and demand planning.*
OD–OS	*Primarily responsible for order build scheduling, and ensuring manufacturing is ready from a material and resource perspective to build customer orders.*
OS–ODel	*Primarily responsible for ensuring orders enter the distribution phase as soon as manufacturing is complete.*
E-2-E Order Management	*Made up of departments that have E2E customer responsibility of order within the ISC organization, but do not directly manage orders through any stage of the process.*
E-2-E Re-engineering	*Not responsible for actual orders in process, but are responsible for system availability and compliance with process requirements.*
E-2-E Administration	*Support groups such as business controls departments that although do not directly process orders are responsible for business guidelines that in turn can impact the E2E process.*
Senior Management	*Responsible for operational decisions impacting order scheduling, resource allocation, and prioritising organizational and process change.*

A survey was carried out across the eight groups to focus on identifying how employees currently access information and knowledge in order to do their respective jobs. The employees were also asked to comment on how

effective they believed the existing approach (codified or personalised) was in supporting them in doing their jobs. From the responses collated, the view from the employees was that the dominant approach was a codified one; with the focus on integrated enterprise systems such as SAP, i2, etc. Although it was felt that these systems were important to the overall supply-chain operation, the dominant focus on these systems meant that individual employees and groups did not have systems that supported more effective control and interaction within their work environment. This view supported Marwick (2001) and Johannessen *et al.* (2001) who both identified the fact that an over dependency on technology would result in a failure to fully address the knowledge needs of an organization. If we then consider Porter *et al.* (1985) who identify knowledge as a key component for competitive advantage, a failure by any organization to fully address its knowledge needs will result in underperformance.

OFP Groups	Dominant Current Approach	Desired Approach
OR–OE	Codified	Mixed (more focus on personalised)
OE–OD	Codified	Codified
OD–OS	Codified	Mixed (more focus on personalised)
OS–ODel	Codified	Mixed (more focus on personalised)
E-2-E Order Management	Codified	Personalised
E-2-E Re-engineering	Codified	Mixed (more focus on personalised)
E-2-E Administration	Codified	Codified
Senior Management	Codified	Personalised

Workgroups Knowledge Approach Gap Analysis

From the analysis, only two groups seem to have the right knowledge system approach; OE-OD (*codified systems*) who mainly ensure that supply is available to build before allowing an order to drop into manufacturing, and E-2-E Administration (*codified systems*) who ensure that business control guidelines and reporting guidelines are followed. From the responses obtained from the remaining groups there was a belief that the existing dominant knowledge system approach did not support the knowledge and information sharing needs of the employees.

How IBM, or any other complex organization, manages the re-alignment of supply-chain relationships must surely impact both immediate and future performance (Lee *et al.,* 1997; Troyer, 1995). Therefore, the senior management team implemented a change programme dependent on developing more effective cross-organizational working relationships in order to improve the end-to-end performance of the OFP. Performance is not simply down to the implementation of elaborate IT systems (Kotter, 1995), but requires the alignment of key personnel in an understanding of the knowledge management aspects relating to the end-to-end processes. This requires management to think about how the business operates from a process, as opposed to a functional perspective (van Weele, 2002). In order to see if the changes driving performance improvement correlated to the desired knowledge approaches, a process optimisation team was set up which in turn was made up of key practitioners from all of the identified work groups, with the exception of senior management. The reason for excluding senior management from this part of the change process was because of the need to develop a "bottom-up" solution for change. Senior management would then be re-engaged to review and prioritise the changes for improvement in line with the organization's strategic direction. In total, the optimisation team identified and implemented 90 changes across the OFP over a period of 4 months. Each change was assessed to determine the type of knowledge transfer mechanism it supported, the work groups it impacted, and the type of knowledge systems approach used to provide a solution for the change. At the end of the 4-month period IBM had managed to get its performance back up to an acceptable level.

Questions

1. Do you think the necessary improvements could have been achieved if the focus had been on information transfer as opposed to knowledge transfer?

2. Moving from a functional to a process-centric perspective highlighted significant gaps in the collective understanding as to how the core OFP worked. What are the key benefits to changing from a functional to a process-centric view of information and knowledge sharing?

3. Considering the need for both personalised and codified knowledge approaches within any complex organization, is it the responsibility of the IT function to define and implement personalised as well as codified systems?

4. The implementation and management of technology are dominant aspects of any IT/IS strategy. However, in this case the over-reliance on technology was causing a problem with knowledge transfer along the core OFP. How can organizations ensure that the right balance between information and knowledge management is maintained?

7.7 Review Questions

True/False Questions

7.1 Tacit and explicit are two types of knowledge. T or F?

7.2 Technology is more suited to managing tacit knowledge than explicit knowledge. T or F?

7.3 Systems that focus on technology to manage knowledge are called "codified" systems. T or F?

7.4 Systems that focus on team interaction to manage knowledge are called "personalised" systems. T or F?

7.5 Information and knowledge are effectively the same thing. T or F?

7.6 Knowledge, unlike information, is about belief and commitment. Knowledge is a function of a particular stance, perspective, or intention. T or F?

7.7 Semantic information refers to the volume of information. T or F?

7.8 Information is a flow of messages, while knowledge is created by that very flow of information, anchored in the beliefs and commitment of its holder. T or F?

7.9 For information to contribute to knowledge creation, the information must contain semantic and syntactic components. T or F?

7.10 To ensure the success of any knowledge management initiative an organization must develop amongst their employees a desire for knowledge. T or F?

7.11 An organizational learning mentality is best supported by a "push" information and knowledge culture. T or F?

7.12 There are four stages of knowledge transfer within Nonaka's organizational learning model. T or F? T

7.13 Tacit-to-explicit knowledge transfer represents the “socialisation” stage of Nonaka’s organizational learning model. T or F?

7.14 Successful organizations focus mainly on developing a “push” knowledge and information culture. T or F?

7.15 Absorptive capacity relates to an individual’s ability to appreciate new information and knowledge. T or F?

7.16 In terms of knowledge sharing, “fear of contamination” occurs when organizations with up-market brand issues are nervous about getting together with people they perceive as more down-market. T or F?

7.17 Causal ambiguity refers to an individual or group’s ability to understand the value of the information or knowledge in terms of what it can be used for. T or F?

7.18 Barriers to knowledge transfer do not actually cause knowledge loss within an organization. T or F?

7.19 Barriers to knowledge transfer impact all quadrants of the organizational learning model equally. T or F?

7.20 Organizations are right to think of technology as the main enabler for knowledge creation, sharing, and transfer. T or F?

7.21 Technology solutions best support explicit-to-explicit types of knowledge transfer. T or F?

7.22 Because of the difference in knowledge culture between organizations, one organization’s successful knowledge strategy may not necessarily be successful for another organization. T or F?

7.23 Tacit-to-tacit knowledge transfer has a significant impact of “empowerment” across the learning organization. T or F?

7.24 For tacit-to-explicit knowledge transfer technology needs to focus on how systems store, access, and transfer data and information. T or F?

7.25 Groupware is designed to support collaborative information and knowledge sharing across a distributed workforce. T or F?

7.26 Innovation is more of an act of intellect then an act of will. T or F?

7.27 The intent of the human-centred information management approach is to put the "human" back at the centre of how organizations view the development of their information systems. T or F?

7.28 For successful innovation to flourish collaboration must be encouraged across the organization. T or F?

7.29 Most organizations tend to focus on aspects of information and knowledge that are explicit and measurable in nature. T or F?

7.30 All knowledge created within an organization will have a positive impact on performance. T or F?

Multiple Choice Questions

7.31 Which of the following is not a valid form of knowledge conversion?

A. Socialisation
B. Externalisation
C. Internalisation
D. Modularisation

7.32 Which of the following is not a valid form of knowledge transfer?

A. Tacit to explicit
B. Explicit to tacit
C. Tacit to tacit
D. Implicit to tacit

7.33 Gupta & Michailova (2004) identified three difficulties with the process of sharing knowledge. Which of the following is not one of the identified difficulties?

A. Knowledge is developed at a local level
B. Knowledge is symmetrically distributed
C. Knowledge sharing is voluntary
D. Knowledge is asymmetrically distributed

7.34 Barriers to knowledge and information sharing can be categorised into three groups. According to Barson *el al.* (2000), which of the following is not one of these groups?

A. Technology
B. Culture
C. People
D. Organization

7.35 There are three barriers that exist in more than one of the categories identified by Barson *et al.* (2000). Which of the following barriers does not exist in more than one category?

A. Culture
B. Trust
C. Existing resources
D. Need for rewards

7.36 Yuva (2002) identifies five characteristics inherent in supply-chain organizations with successful knowledge management models. Which of the following is not one of those characteristics?

A. Trust
B. Common language of understanding
C. Awareness of the knowledge and skills of others
D. Efficient core processes

7.37 In terms of Groupware, there are broadly three levels of collaboration. Which of the following is not one of those levels?

A. Coordination
B. Consolidation
C. Communication
D. Collaboration

7.38 When considering a knowledge management strategy which of the following is not a key guiding point?

A. Thinking in terms of desired outcomes
B. Knowledge requirements vary across the organization
C. Knowledge creation and sharing are human functions
D. Technology can support all types of knowledge transfer

7.39 Pavitt (2006) identifies three broad overlapping sub-processes of innovation. Which of the following is not one of the sub-processes?

A. Codification of knowledge
B. Production of knowledge
C. Continuous matching
D. Transformation of knowledge into artefacts

7.40 Which of the following is not a characteristic of the human-centred approach?

A. Emphasising information use and sharing
B. Letting individuals design their own information environments
C. Building enterprise-wide structures
D. Continuing until the desired behaviour is achieved enterprise-wide

7.8 Review Question Answers

True/False Answers

7.1 T, 7.2 F, 7.3 T, 7.4 T, 7.5 F, 7.6 T, 7.7 F, 7.8 T, 7.9 T
7.10 T, 7.11 F, 7.12 T, 7.13 F, 7.14 F, 7.15 T, 7.16 T
7.17 T, 7.18 F, 7.19 F, 7.20 F, 7.21 T, 7.22 T, 7.23 F
7.24 F, 7.25 T, 7.26 F, 7.27 T, 7.28 T, 7.29 T, 7.30 F

Multiple Choice Answers

7.31 D, 7.32 D, 7.33 B, 7.34 B, 7.35 B, 7.36 D, 7.37 B
7.38 D, 7.39 A, 7.40 C

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Chapter 8: Information Systems: Shaping the Organization

Learning Objectives

On successful completion of this chapter a student will be able to:

- Understand how technology can impact organizational performance in positive and negative ways.
- Identify the main socio-technical interaction areas, and their potential consequences to the organization as a whole.
- Assess the appropriateness of new technology to an organization.
- Explain how the work-design model can be used to better align technology to work practices.
- Explain how technology can be used to control or enable a workforce, and when and where these different approaches are most appropriate.
- Describe how technology can have intended and unintended consequences on work practices.

8.1 Introduction

With the advent of internet technologies, organizations have been able to develop new channels to market at an unprecedented rate. Organizations no longer need a physical presence within a geographical region in order to do business. With easy access to web development and e-commerce tools they can almost instantly set up and start trading at relatively low costs. This access to an online environment has also meant that organizations are no longer constrained by the more traditional view of a business, such as retail shops needing to be on the high street of every town, or banks needing a physical presence in towns, or even universities needing a physical campus in order to provide education.

This freedom to be able to reach out to a much wider audience has not only provided organizations with increased revenue, it has also allowed organizations to streamline and restructure themselves in a way that can take

significant cost out of the business. No longer needing a shop front for the business has allowed many successful retailers, such as **Amazon**, **Dell**, and **Interflora**, to remove significant cost associated with setting up and maintaining a visible presence in the main trading areas of towns and cities.

However, this is not the only change that technology has brought to organizations in terms of structure and work practices (Orlikowski & Scott, 2008). Automation has also helped organizations to remove the need for manual intervention or the control of basic, repetitive processes. Processes such as line manufacturing, order processing, stock checking and replenishment, marketing, and distribution scheduling can now be automated. This has resulted in a significant reduction in human error, while at the same time facilitating the easy scalability of core processes, without the need to significantly increase any associated labour force cost. All in all, the advent of technology seems to have improved the competitive nature of organizations.

That said, the adoption of technology is not always a smooth process. Whilst technology can significantly reduce labour costs associated with repetitive core processes and facilitate a relatively fast entry into new and emerging global markets, the adoption of technology can have an important and fundamentally destabilising influence on morale and organizational performance if key aspects of the socio-technological interaction are not considered. In particular, this chapter will look at the effect of technology on the following socio-technological interactions:

- Technologies impact on work practices
- Technologies impact on political boundaries
- Technologies impact on cultural practices
- Technologies impact on management decision-making

The interactions listed here need to be considered as any new systems can and will change the dynamic that currently exists within the organization. What this chapter sets out to do is simply highlight the possible implications that technology will/can have on the organization. It is down to each organization, once aware of these possible implications, to decide if the adoption of new technology is appropriate on not.

8.1.1 Socio-technical Interactions

An important point to be made throughout this book is that the application of technology will not make bad or weak management practices better, only worse. Technology has an amplifying effect on the performance of processes and practices across an organization. Therefore, the successful adoption and implementation of any technology or system will be based on the quality of the foundational processes or practices over which the technology will be laid. This is an important point to make and understand. Many organizations have reacted too quickly in investing and adopting new technologies without fully considering or understanding the implication such technologies will have to their existing business processes and models. A prime example was the **Dot.Com** bubble crash between 1999 and 2001. Many organizations raced to invest in web technologies and develop a web presence without fully considering the implications this would have on their existing organizational structures and business models.

Thankfully, organizations are now a lot more cautious about such ventures and put a lot of thought into assessing the potential impact that new technology will have on their ability to operate. However, the following areas should be considered when implementing new technology.

8.1.2 Expected and Unexpected Consequences of Technology

Without doubt, a significant area of impact, when it comes to technology adoption has to do with how work gets done. Whether it's an expected, or an unexpected consequence of technology adoption, the manner in which employees conduct their work will be affected. What is also worth bearing in mind is that unexpected consequences can be both positive and negative. Positive unintended consequences are a bonus; however, negative consequences can have a serious impact on the planned performance improvements the technology was expected to deliver. For example, Table 8.1 below identifies the effects, both expected and unexpected, of some technologies on work practices. In this example the unexpected consequences are negative in nature.

Technology adoption	Expected consequence	Unexpected consequence
e-mail	Increased communication	Fragmented work practices
VPN technology	Improved off-site access	Longer working hours
Laptop computers	Improved mobility	Increased back/posture /strain issues/complaints
Mobile device connectivity	Improved connectivity	Increased risk of security breaches

Table 8.1: Expected and Unexpected Consequences

As some consequences are unexpected, it will be difficult to plan for them. That said, organizations need to be aware that technology can bring as many new challenges as it does solutions. A perfect example of this relates to the increase in use of personal devices for accessing work systems. Many people now like to access their work email and documents via their own mobile devices. In turn, many organizations support this way of working because it ensures that employees are connected to the organization for much longer than the traditional 9am to 5pm period. However, this level of access brings significant security risks in terms of both physical (who else has access to the device, where is the device being used?) and digital issues (how stable is the software on the device, is the device clean of viruses and other malware?).

Therefore, when considering the implementation of new technology, the organization should spend some time mapping out what it believes to be the consequences of such a deployment. In effect, organizations need to carry out a form of risk assessment. One such way of assessing the consequential impact of technology is as follows:

Technology	Consequence	Likelihood 1-3	Op Performance Impact 1-3	Strategy Performance Impact 1-3	-/+ Impact	Score
Introduction of mobile devices	Increase no of contactable employees	3	3	2	(+)	+ 18
	Increased data vulnerability	2	2	3	(-)	- 12

Table 8.2: Consequential Risk Assessment

The sample assessment outlined in Table 8.2 identifies an example of a technology to be adopted; in this case, the introduction of mobile devices. In the second column from the left, the consequences, both intended and unintended, are identified as best as possible. The next three columns look for the likelihood (or probability) of the consequence happening, followed by the expected impact of the consequence on operational performance, followed by the expected impact of the consequence on the organization's strategic performance. Each of these has a scoring system of 1 to 3; 1 representing a low, 2 a medium, and 3 representing a high probability of impact. The second to last column on the right assesses whether the consequence is expected to have either a negative or positive impact. The final column represents all three scores multiplied together with the positive or negative identifier attached.

This is a very basic tool for assessing the overall impact of the consequences, but it allows the organization to objectively identify and review the overall potential impact that a technology may have on an organization's performance. In the example in Table 8.2 the positive consequences outweigh the negative consequences. However, this could easily be the other way around. Where this is the case, and the total score for negative consequences outweighs the positives, then the management team should seriously reconsider whether implementing the technology is the right thing for the organization.

8.1.3 Impact on Work Practices

The more organizations that adopt and integrate technology into their core business processes, the more technology will impact on the way employees carry out their work. As discussed in Chapters 2, 3 and 4, technology is becoming a key part of how we interact with our work colleagues. In today's modern organization it is hard to imagine how one could get anything done without access to even the most basic technologies such as a phone or computer. The pervasive nature of technology has changed both the nature and types of work that individuals now find themselves engaged in. Take for example the commercial introduction of email in the 1970s. Prior to this it was not uncommon for a manager to have a secretary take dictation and type; two very important skills for the professional secretarial assistant. By the mid-1990s, most managers were reading and responding to their own mail via email, and the skill-set for the

secretary was changing. It was no longer a key requirement to be able to take down shorthand and type 60 words a minute. Now secretaries are being assessed and hired on their ability to manage and coordinate schedules, diaries and events.

Another, more recent example of how technology has changed the nature of work relates to software testing. The need to test software before release is very important if the organization is to maintain a sound reputation for the quality of its software. Through the early 2000s job recruitment sites were full of adverts looking for competent software testers. This period indeed proved to be very lucrative for individuals with these particular skills. However, over the period of a few short years the functions required to test software were broken down into algorithms and procedures, and then built up into software testing applications. This in turn had the effect of automating many aspects of the software-testing role.

Without doubt, the increased use of technology has supported the move of most organizations to a higher dependence on information in order to understand and shape their operating environment. The information-centric view of the organization (Davenport, 2005) is also shaping the skills that organizations are looking for in their current and future workforce. For example, IBM, in the late 1990s, developed a competitive capability in software programming. However, as organizations started to demand more from their software and software vendors, organizations such as IBM began to realise that the skills required to deliver value were changing. The real value would be in enterprise architecture. Within the period of a few years IBM significantly reduced its number of programmers, who were subsequently replaced with enterprise architects.

Therefore, the implementation of technology can result in a significant change to not only the way in which individuals work (Huber, 1990: Dewett & Jones, 2001) but also the structure of their work. Changes to work practices can range from something as simple as the automation of basic repetitive tasks, such as working with spreadsheets, to enabling employees to work more remotely from the main offices for long periods of time.

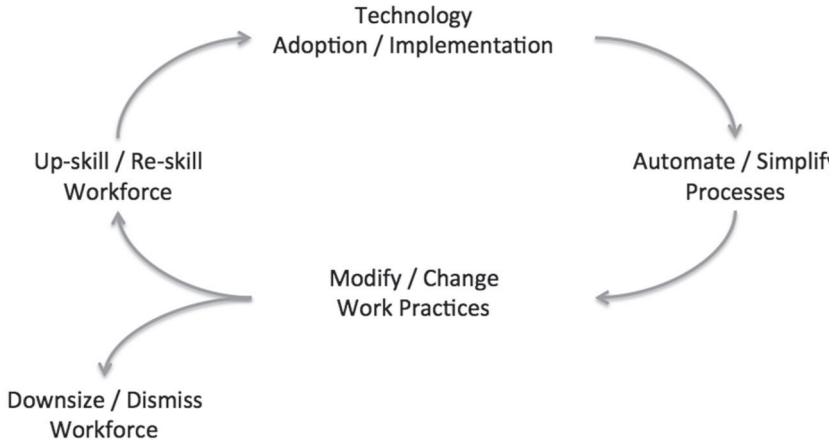

Figure 8.1: Impact of Work Practices

Figure 8.1 highlights the manner in which technology can impact work practices, and how organizations can then respond to the changing practices. So, from the diagram we see that technology will have some impact on the automation or simplification of core business processes. As these processes change, the level and frequency of human interaction will also change. This in turn will bring a change to the way employees work, which in turn may manifest in a number of ways:

- More time available for other tasks.
- Less requirement of certain skill sets (e.g. software testing).
- Increased requirement for new skill sets (e.g. enterprise architects).

This will necessitate a change in the work practices of employees if performance efficiencies are to be realised. At this point, the organization can either reduce the number of employees accordingly, or re-train employees to work on higher value tasks.

The impact that the adoption of new technologies can have on employees will depend on how the technologies are introduced, and how much the employees feel part of the implemented decision-making process. If employees are not consulted or included in the decision-making process this may result in actions to disrupt or halt the implementation process.

8.1.4 Impact on Political Boundaries

The deployment of new technology can have a significant impact on the political boundaries that may exist within an organization. This is where individuals, who may hold a similar position in terms of their grade or seniority, may have more influence over the workforce due to the number of direct-line reports they have, or the perceived importance of the role they hold. As such, it is not unusual for a manager's level of influence, within the organization, to be based on the number of direct-line employees he or she has control over. The function of a department, and its relevance to the successful operation of the organization, will also increase the political influence an individual will have. So, a manager in a telecoms firm who is responsible for new product development may have more political influence than, say, a manager responsible for facilities management.

The adoption of new technologies can significantly shift the political power balance for an organization. This may, in turn, have a positive or negative impact on the operational performance of the organization. In effect, and as discussed in section 8.1.1, there will be both intended and unintended consequences. As with all consequences it is important to understand if they will have a positive or negative impact on performance, and therefore, if they are worth the investment.

For political boundaries, an important consequence is the re-alignment of political power. This can either have a positive or negative effect depending on the overlying objectives of the management team.

- **Positive consequences:** Decisions are no longer heavily influenced by, and weighted towards a certain part of the organization. This may also help re-engage members of the management team who have felt marginalised in the decision-making process.

- **Negative consequences:** Power brokers may resist attempts to re-balance power by either overtly or covertly undermining attempts to adopt new (technology enabled) processes and work practices.

Through the application of technology, the balance of control and influence can be re-distributed across the organization. The old adage "*information is power*" is true, especially within information-driven organizations. The person, or persons who control access to, or the flow of information retain

a high level of power and influence within the organization. Understanding how this power is distributed and used is very important if any changes are to be made in terms of strategic objectives or direction. A significant change to either of these may be seen as a direct attack on a key individual's position of power. As such, and as highlighted above, some of those looking to retain their power bases may overtly or covertly try to resist any changes that will reshape the political/power landscape. Even though attempts to resist change can cause a lot of disruption for an organization, there are major benefits that technology can bring in helping to reduce an imbalance of power manifesting across the organization. These are as follows:

- **Improved information access:** By removing unnecessary barriers to information, those responsible for the operational performance of the organization can get a better understanding of what's actually happening across the organization through open access to unbiased data. In many instances this may even become available in real time.
- **Improved decision-making:** Better access to data and information, which are not weighted towards anyone's particular agenda, will improve the quality of the decision-making.
- **Improved transparency:** Direct and open access to information and data ensures transparency across the organization. Therefore, decisions can be traced back to the data and information used to inform them. This ensures more careful consideration is made in the decision-making process, due to clearer accountability.
- **Improved governance:** As transparency and accountability improve, it becomes easier to see how decisions are being taken, and by whom. Therefore, those in a position of legitimate influence must be seen to be making decisions that are in the best interests of the organization as a whole, and not just in their own respective parts of the organization.

It should be noted that technology will not fully rebalance power and influence across an organization, or fully remove the levels of political influence that certain members of the organization may have (Attewell & Rule, 1984). However, it can, if implemented correctly, provide the improvements listed above, which in turn will help to negate the influence of any informal power structures across the organization.

8.1.5 Impact on Cultural Practices

Individuals interact with technology in different ways, and culture plays a big part in how this happens. Whether it's how individuals access and share information, or how work practices differ from one culture to another and how technology supports and shapes these practices (Karyotakis & Moustakis, 2016). According to Schein (2004), cultural differences are best assessed against their values, which in turn are a set of norms whose importance is related to the social group being studied. There are many studies to identify and measure cultural difference and Hofstede's work (2001) has played a seminal role. Although many researchers now contest the relevance of Hofstede's original research, the basis of the research is a good way of viewing cultural difference. Hofstede viewed cultural difference through a number of broad lenses, such as:

- **Power distance**: In terms of task management, what is the ratio of management to workers?
- **Uncertainty avoidance**: How much risk or uncertainty are workers comfortable with?
- **Individualism – collectivism**: Do workers prefer to work as part of work groups, or is individual working preferred?
- **Masculinity – feminism**: What is the dominant style of management?
- **Long-term or short-term orientation**: What is the focus in terms of strategic thought?

Whilst many management researchers feel Hofstede's framework is not inclusive enough and should be broadened to include more aspects of cultural difference, the framework provides a useful starting point in understanding cultural difference at a national level. Kemper *et al.* (2011) show the cultural difference of four countries based on Hofstede's power distance, individualism/collectivism, and uncertainty avoidance (Figure 8.2).

	Power Distance	Individualism/Collectivism[a]	Uncertainty Avoidance
China	80	20	30
Germany	35	67	65
Hong Kong	68	25	29
United States	40	91	46

[a]A higher score on the individualism/collectivism dimension represents higher levels of individualism.

Figure 8.2: Cultural Differences based on Hofstede's Model (Kemper *et al.,* 2011)

However, irrespective of national differences, organizations can develop their own cultural practices and norms. A useful model to help understand these cultural paradigms has been developed by Quinn *et al.* (2003). In the Quinn *et al.* (2003) model, culture is influenced along two axes (Figure 8.3), the horizontal axis representing the difference between the internal and external management focus, and the vertical axis representing the difference between control and flexibility in terms of how work gets done.

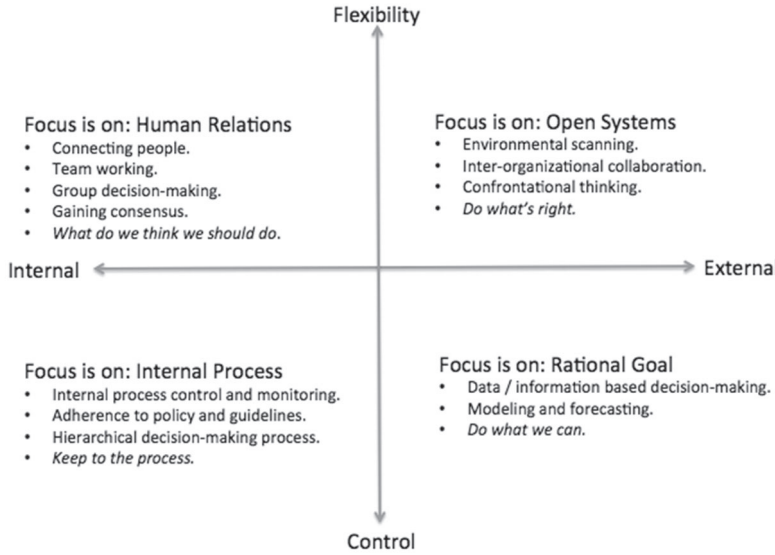

Figure 8.3: Cultural Types (based on Quinn *et al.,* 2003)

Each of the quadrants in Figure 8.3 identifies dominant cultural characteristics, which will impact how technology is implemented. For example, an organization that has an **Internal Process** focus, will place a high dependency on the control and monitoring of its core processes. Focus will mainly be on how the core processes perform as opposed to how they are aligned to meet changing customer requirements. The optimization of core business processes is viewed more highly than the need to develop customer-responsive processes. Organizations that might fit within this quadrant would be established organizations that may have a monopoly, or near monopoly within their market.

Organizations in the **Open Systems** quadrant are more focused on understanding what's happening within the competitive environment, and reacting as quickly as possible. These organizations can become very responsive and quick to react to market forces. However, they can also be inconsistent in the delivery of their services to customers, due to the lack of discipline and consistency around core process control and optimization. The types of organizations usually found in this space would be small start-ups.

In terms of the other two quadrants, these do not align to any particular type of industry. However, what does differentiate the two quadrants is the approach to processes and decision-making. For organizations in the **Human Relations** quadrant, the focus is on collaborative decision-making, with a leaning towards qualitative data. This suits organizations focused on creative project type work, such as design consultancies. The last quadrant is focused on **Rational Goals**. The use of quantitative data for the purpose of informed decision-making is very important. Organizations that tend to favour this approach are looking to understand their external environment, and develop a predictive view in order to model possible scenarios. Types of organizations that favour this approach would be process driven, such as in the manufacturing and delivery of products and services.

How people see technology in terms of supporting or threatening their culture, will determine whether they accept or reject the technology.

8.1.6 Impact on Management Decision-making

The ability to make effective and timely decisions within any organization will be dependent on how quickly relevant information and data can be accessed. Across any information driven organization, technology will play an important role in connecting people to the right information and data sources necessary to support the decision-making process; whether this is simply connecting people via e-mail or instant messaging, or controlling access to databases containing sensitive performance data. Technology's pervasive nature has ensured that within the modern organization, access, sharing, and even interpretation of data and information are shaped and influenced by the technology employed within and across the organization.

Providing greater access to information and data means that end users can interpret the information and data first hand, and develop an opinion as to how best to proceed. This may put the end users at odds with those actually responsible for making the relevant decision. In effect, technology can help to either centralise or decentralise decision-making. Whichever direction the organization chooses to go in will be influenced by the organization's culture in terms of information and knowledge sharing. Referring back to the Quinn *et al.* (2003) model on cultural types, organizations tending towards the **Open Systems** focus will use technology to provide easier and more open access to information and data, whereas, organizations tending towards **Internal Processes** may look to use technology to provide a more controlled level of access to information and data. To get a better sense of how decisions can be influenced and supported through the implementation of technology revisit Table 7.4 in Chapter 7 (Using Technology to Support Knowledge Transfer). This table has been modified to represent the main decision-making types that technology can support (Table 8.3).

Knowledge Transfer	Main Focus/Behaviour	Technology	Decision-making Focus	Examples
Tacit to Tacit	Innovation	Team rooms, Wikis, Collaboration technologies	Decisions relating to information and data sharing, and validation.	Lotus Notes, Skype, Lync, Instant messaging, email, VoIP, PMwiki
Tacit to Explicit	Standardisation/Formalisation	Fulfilment systems, Financial systems, Business control systems	Decisions relating to process initiation/flow/termination.	SAP order management, Salesforce.com, Sage, Oracle
Explicit to Explicit	Control	ERP, Warehouse management systems, Logistics tracking systems	Decisions relating to process optimisation.	Oracle Fusion, i2, DB2, mySAP, PeopleSoft, RFID
Explicit to Tacit	Empowerment/Enablement	Dashboards, Data visualisation	Decisions relating to operational/strategic prioritisation.	Tableau, SAS, SPSS, Crystal Reports

Table 8.3: How Technology can Influence Decision-making

The decision-making focal areas, as outlined in Table 8.3, provide a guideline when considering the impact that technology can have in supporting decisions being made across the organization. So, for example, where **Innovation** is the main behaviour to be stimulated, it is important that the technology is implemented in a way that supports an individual's desire to create and share information and data with other stakeholders.

In the case of **Standardisation/Formalisation,** the organization is focused on taking information and data in their potentially unstructured form and transforming them in a way that the information systems can use. This information and data will be used to update information and data being used across the core processes.

Where the main focus is **Control,** the types of decision-making will be similar to those dominating the desired **Standardisation/Formalisation** behaviour. However, computer algorithms designed to optimise process flow and performance will largely drive these decisions.

If **Empowerment/Enablement** is the main behavioural focus, technology will be used to drive clarity and understanding around information and data. The focus is to provide decision-makers with access to the necessary and relevant information and data sources that are both internal and external to the organization.

It is important to remember that work practices, political boundaries, and organizational culture will all have an impact on the quality of decision-making across an organization. After all, decision-making is fundamentally a cognitive process, and as such the output from a decision-making process can either be rational or irrational. This may also be true even in the case of algorithm-based decisions as the development of these algorithms can be considered the product of a human cognitive process. Therefore, although technology may not be held responsible for the quality of decisions made within an organization, it can be held responsible for the following:

- **Transparency of information/data**: Providing the end user with a view of where the information/data have come from and, therefore, their validity.
- **Accessibility to information/data**: Providing the right level of access to end users based on their user requirements. Also ensuring end users are connected to the appropriate information/data sources in order to support their decision-making requirements.

- **Currency of information/data:** Ensuring the information/data are up to date and refreshed at a rate appropriate to the end users' needs. The rate of refresh will depend on the business need, such as the New York Stock Exchange, which updates share price data in real time, whereas production numbers for a manufacturing organization may not need to be updated more than every 4 to 6 hours.
- **Clarity of information/data:** The technology can be used to sort and filter information and data in a way that will aid end-user understanding and comprehension. For example, data visualisation techniques can be used to present large data sets in a visual and more understandable format.
- **Analysis of information/data:** Technology can be very effective at conducting analyses of extremely large and fast-moving data sets for organizations. Analyses such as weather and stock market predictions, predictive analytics of market trends, and even just stock management and control can be carried out in real time.
- **Accuracy of information/data:** This relates to the analysis of information/data. Some systems will round up/down or approximate data values. How this is done is important as over a short period of time the approximated results may have little impact, but over a significant period of time the approximations can cause significant distortions in the data. This can be a problem for systems responsible for scenario planning, forecasting, and scheduling.
- **Security of the information/data:** Information and data are, for many organizations, the most valuable asset they have. Unwarranted access to this information/data can mean the difference between staying in business or going out of business. Therefore, the use of technology is now vital to ensuring that the organization's information systems, and the information and data they contain, are not compromised.

Time Out

Think about it: Moving with the Times

U-print Ltd. is a small publishing company that has been providing printing services to authors for 25 years. Most of the customers are looking for small publishing runs of less than 500 copies of their books, and as such the business model has been geared to support this growing niche market. By keeping up with the latest technology advancements in printing

technology, U-print Ltd. has been able to keep costs relatively low for each print run. This has kept them competitive, and the first choice for many first-time publishers.

Lars Petersson has been the managing director for the last 15 years and has spent all his working life (so far) in the publishing industry. He has seen the company grow from 10 employees to 100 in the last 10 years. This has been in response to the growth in demand for self-publishing.

However, part of the recent growth in self-publishing is also being driven by easier access to online publishing resources, such as www.IntoPrint.net and Amazon's online publishing services. Lars has given this some thought and what has occurred to him is that where advances in printing technology has made his company's job easier, the advent of internet publishing has made the author's job even easier. This change in how the author can now get published is going to have a significant impact on their business. This view is quickly borne out at the monthly senior management meeting. Gale Young, the sales manager, reports that while overall demand for publishing has increased, most of the demand is shifting to online providers, and this is having a negative impact on U-print's sales and revenue figures.

Jorge Kelper, the IT manager, makes the suggestion that maybe they should consider developing an online offering as well. The service could be tiered so that authors could get as much or as little help as they required throughout the process.

Lars likes the idea, as it would provide a quick and easy way to scale their business without too much additional operational cost, after the initial setup costs needed to get the online side of the business up and running. However, Gale Young, who manages the second largest department of 20 sales reps, is concerned over how this will impact the core, or existing business. Mike Dirac, the publications manager, is also concerned as he isn't sure how this will impact how his team (45 editors, proof readers, graphic designers etc.) will work to deliver the new online business.

Whilst Gale and Mike run their respective departments very well, they manage the flow of information, including performance metrics very

closely, and do not tolerate any interference from other members of the management team.

One thing is for sure though, a decision will need to be made as to whether to stay as they are or get online…

Questions:

- Do your think Gale and Mike have legitimate concerns relating to the possible new direction for the business?
- Should Lars consider any potential positive and negative consequences? And if so, whom should he include in building the list of consequences?
- Connecting to a larger market is very tempting. What other benefits will the possible technology bring in terms of resetting influence and power across the organization?

8.2 Ensuring Organizational Alignment

As we can see from the discussion so far, the adoption of new technology can have both positive and negative effects on organizational performance. Therefore, it is important that those making the decision to adopt new technologies are able to assess, as far as possible, the effects the technology will have. Whether the technology being deployed is a cloud-based wiki for team working, or a SAP fulfilment system for smoother order management, the technology can necessitate the re-thinking of significant aspects of how the organization is aligned. In particular, the adoption of new technology can impact the following aspects of alignment:

- **Resource allocation:** What resources will the technology do away with? If the technology has developed an online capability, or has provided employees with an opportunity to work remotely, will there still be the same need for office space or retail outlets?
- **Skills requirement:** Does the new technology require new skills and knowledge? How does this affect the existing workforce? Can an organization develop the new skills in-house, or will it need to hire in individuals with the new skills?

- **Staffing levels:** Does the organization still require the same level of staffing now that the technology has been deployed? If the technology has removed a lot of manual work, what will become of the existing staff? Will they be redeployed, re-trained, or let go? This will have an impact on department sizes, and their perceived relevance and importance within the organization.
- **Capability prioritization:** Which capabilities give the organization a competitive advantage? Has technology simply reduced certain tasks to automated processes that can be effectively outsourced? Or has technology created a unique ability to be further invested in, and developed?

Without doubt, the impact of technology within these areas needs to be understood, as a failure to assess it will result in unnecessary redundancies in terms of how resources are managed and aligned. This in turn may well result in unnecessary costs being incurred by the organization.

8.2.1 Understanding the Reasons for Technology Adoption

So, if these issues exist, and can cause significant problems for organizations, why do it? Certainly, the decision to adopt new technologies needs to be thought through carefully, and should definitely not be made just in order to keep up with the latest technology. Reasons for the adoption of new technologies can be driven by any of the following considerations:

- **Legislative requirements:** Organizations may be required by law to update aspects of their technology to comply with certain legislative directives. For example, the EU has placed legal requirements on organizations holding customer data, which impacts how and where organizations physically store their data.
- **Reducing cost:** New technology can significantly reduce running costs. The advent of cloud delivered services means organizations no longer need to invest heavily in their own server farms, but can purchase cloud-based services as and when required.
- **Maintaining competitive position:** Internet technologies can open up new marketing channels into new geographical regions and demographics. This can be done quickly and at relatively low cost, which in turn can prove very profitable for organizations.

- **Responding to customer needs:** Technology can bring the organization closer to the customer without the need to develop a high street presence. Through the use of mobile and internet technologies customer interaction can be better managed, thus giving in some instances, a real-time view of their changing requirements. This allows the organization to respond faster and more precisely to customer needs.
- **Compensating for skills shortages:** Some key skills may be in low supply, and/or expensive to acquire. Therefore, technology can automate the lower level aspects of these skills, thus reducing demand for the skills. An example of this would be the use of software to provide localised content (local languages) on websites.
- **Enabling scalable processes:** Human error can cause inconsistencies in the quality of service. If service is a key differentiator for an organization it is vital that as demand grows the quality of service delivery remains consistently high. If implemented properly, technology can help to maintain a high level of quality as processes scale up.
- **Developing responsive business processes:** Technology can be used to develop a 24/7 response without any additional need for overtime, or out-of-hours payments to employees. Therefore, the organization can continue to deliver its products and services irrespective of the time of day the customer wishes to engage.
- **Reducing security risks:** Technology can improve security through the enablement of strong encryption technologies, and biometric scanning. These technologies can also be used to improve security around access control to data and physical locations that may have commercially sensitive material.
- **End-of-life technology:** Even if the existing technology works, the vendors or suppliers responsible for ongoing support and maintenance may look to transition their customers onto newer technology, and as a result remove the existing support of older technologies.

These are just some of the more obvious reasons for adopting new technologies. All will come at a cost, but the list highlights some of the main advantages of adopting technology. However, there are equally valid reasons for not adopting, or delaying the adoption of, a new technology. Some of the more common reasons are as follows:

- **The cost of technology:** In order to adopt a new technology, the old existing technology will need to be removed. This may incur additional costs on top of the cost of the new technology.

- **The requirement of new skills:** New technologies may require new skills in terms of maintaining the systems and end-user interactions. Again, this can prove costly if the organization needs to up-skill its work force in order to properly utilise the new technology.
- **Potential security/stability risks:** With new technology come new risks in terms of security and stability. For example, many organizations as of 2019 are still using Windows XP and Windows 7 platforms because there are security risks and system stability issues which are still not fully understood with newer platforms, such as Windows 10.
- **The existing technology works:** This is closely related to the last point. Basically, if the existing technology works, and is still supported by the vendor then why take the risk of moving to a new, and largely untested system? This is a major consideration for technologies supporting mission-critical systems and processes.
- **Changes to work contracts/practices:** The introduction of new technologies may have an impact on working practices and conditions. If this is not agreed with the work force before implementation, industrial action may result. Therefore, the implementation of new technologies may be delayed or postponed until an agreement between the management and the workforce has been reached around changes to work practices.
- **Disruption to customers:** The new technology may necessitate a different way of interacting with the customer. Whilst the technology may improve internal process efficiency and effectiveness, changes to the way customers interact with the organization can have an adverse impact on revenue. This is especially the case if the customer is required to learn a new skill in order to interface with the new technology.
- **Disruption to core processes:** Organizations may hold off the deployment of a new technology if it will have a disruptive effect on operational performance, especially at certain busy times of the year, such as the end of a quarter or financial year.

It is likely that an organization considering a new technology will be affected by a combination of both reasons for and against adoption. Once again, the challenge for the management team will be to identify and assess which reasons impact the most, and then decide accordingly.

8.2.2 Factors Impacting Successful Technology Adoption

When talking about modern organizations it is important to think of them as information driven in nature. What this means is that the success of the organization is dependent on how well it can create, store and share information in order to make timely and effective decisions. To that end, the barriers to technology adoption are no different to those discussed in Chapter 7: Using Technology to Support Knowledge Transfer. To recap, the main barriers can be broken down under three headings; technology, organization, and people (Barson, *et al.,* 2000).

Technology	**Organization**	**People**
Existing resource	Existing resource	Existing resource
Available technology	Need for rewards	Need for rewards
Legacy systems	Culture	Culture
	Targeting	Internal resistance
	Costs	Self-interest
	Proprietary knowledge	Trust
	Distance	Risk
		Fear of exploitation
		Fear of contamination

Table 8.3: Barriers to Knowledge Sharing and Management (source: Barson *et al.,* 2000)

To recap on what Barson *et al.* (2000) said about barriers, it is worth revisiting their view on how barriers can impact a disruptive technology driven change; which is effectively what can happen when a new technology is introduced into, and across an organization. Barson *et al.*'s (2000) view of barriers is that there is another category that can be identified: the list of all **cross-category barriers**. This category contains all the barriers that exist in more than one of the three main barrier groups. A more detailed description of the Barson *et al.* (2000) categorisation of the four barrier classes is given below:

1. Cross-category Barriers

- **Existing resource:** Simply put, if an organization is to operate knowledge creation and sharing then there must be the required resource available. Organizations must also have employees who can implement and develop the knowledge that has been accrued. This is implying a "pull", or knowledge "seeking" culture.
- **Need for rewards:** This barrier concerns both the organization and people. Rajan *et al.* (1998) cited by Scarborough *et al.* (1999), states that "it is essential that employees can see that sharing means immediate gains such as less hassle, or easier tasks, reducing working hours or earlier closing." The need for rewards is a people issue whereas the mechanism for conferring rewards is an organizational issue.
- **Culture:** The Lotus Corporation (and indeed Kluge *et al.,* 2001) points out that a company's culture may not support sharing and reusing knowledge. Although Lotus recommends overcoming this barrier through technology the general view is that this should happen through a combination of codified and personalised methods. It is also important to look at culture from a push or pull perspective as this largely determines how employees will access and use the information available. If the culture is predominantly either "push" or "pull" this may be seen as a barrier as either the soft aspects of KM are being overlooked or the IT systems are not in place to support information routing and sharing.

2. Technological Barriers

- **Available technology:** Swartz (1999) and Marwick (2001) suggest that technology is still unable to provide a single knowledge solution, and that an organization's IT solutions are usually a combination of cobbled-together applications.
- **Legacy systems:** Swartz (1999) identifies legacy systems as a significant barrier to knowledge management. Connecting the systems of multiple departments, especially when there is no common standard approach to IT deployment, makes it difficult to provide a solution for an efficient knowledge transfer system.

3. Organizational Barriers

- **Poor targeting of knowledge:** Scarborough *et al.* (1999) point out that "information needs to be targeted if it is to serve knowledge". Therefore, if a knowledge management system is to be effective it must be clear about what information it needs and what it expects to generate by way of knowledge.
- **Cost management of knowledge transfer:** Farr & Fisher (1992) point out that a barrier to inter-organizational knowledge transfer is the cost of managing collaboration.
- **Protection of proprietary knowledge:** Sharing proprietary information with collaborators leaves an organization open to the risk that the information will be revealed. The consequence of this belief is that resistance grows within an organization to sharing proprietary information with suppliers.
- **Distance –** According to Nonaka (1991) the most efficient means of transferring knowledge is through face-to-face communications. However, the distributed nature of today's organization may make this difficult to do as different cultural, legal, and linguistic environments can also impact knowledge transfer.

4. People Barriers

- **Internal resistance:** This is where knowledge is hidden or its flow restricted in order to protect the interests of the organization.
- **Self-interest:** This is when customers may not be willing to provide information to a supplier for fear that the information will filter through to competitors.
- **Lack of trust:** Trust impacts the way we perceive received information and the value we place on it, and also the manner in which we share information. If an individual does not trust the recipient of the information to use it wisely, and in the best interests of the organization, this will affect how much information is passed between the individuals.
- **Risk:** Risk is related to both trust and proprietary knowledge barriers. Inter-organizational knowledge sharing inherently involves an element of risk, particularly when proprietary knowledge is being shared.
- **Fear of exploitation:** According to Lucas (2000), a fear of exploitation starts with the premise that "I will only share my knowledge with you if I think you can give me something in return". Although Barson *et al.* (2000) see this as a "people" barrier, the solution to resolving this problem is very much an

organizational one.

- **Fear of contamination:** This barrier refers to when organizations with up-market brand issues are nervous about getting together with people they perceive as more down-market (Lucas, 2000).

Whilst every organization's structure, culture, and political landscape will be different, the dependency on technology to connect individuals and share information will be the same. Without technology to support this most basic of functions, organizations cannot hope to effectively compete in today's competitive environment.

Time Out

Think about it: Assuring a Smooth Transition

The management of U-print Ltd., a small printing company, has made the decision to develop and launch an online publishing service. The plan will be to initially grow the business organically, targeting existing customers by transitioning them across from the existing model to the online model.

Lars Petersson has put Jorge Kelper in charge of the development and implementation of the new technology required to provide an online service. Lars and Jorge have done the numbers in terms of costs and are quite happy that the cost of the technology will be quickly offset by the reduction in labour costs; even with a 10-15% uptake by existing customers the new business model will start to see a profitable return in 18-24 months.

Gale Young, the sales manager, and Mike Dirac, the publishing manager, are still concerned over how the transition will work, and the potential impact on morale that the new business direction is having on existing staff. So far, all communications from Lars concerning the online business have been focused on explaining the commercial imperative for moving online, and the need for the business to "move with the times…". As Gale and Mike rightly point out, this is not really making any of the staff feel at ease concerning the future of their jobs, or the way they will need to work after the launch of the new systems.

Rick Grimes, head of HR, is starting to get concerned over the number of employees who are expressing a level of anxiety over the new online service. This has been brought to the attention of Lars, who has said they simply need to keep pushing and get through the implementation as quickly as possible, then everything will settle down. Rick, is not convinced…

Questions:

- Are there any factors that the management team should consider that might impact the successful transition to the new online publishing service?
- How do you think the cross-category barriers would manifest in this case, and how would you recommend their risk is mitigated?
- Should the management of the implementation of the online business be left to the IT manager to run? Who else should be part of the planning and implementation decision-making process, and why?

8.3 Learning Summary

The adoption and implementation of technology will have an impact on the organization in many ways. This chapter has identified four major areas where technology can reshape the practices and attitudes of end users in terms of how they engage with the organization. The four areas are:

- Work practices
- Political boundaries
- Cultural practices
- Management decision-making

These areas are interdependent, and organizations looking to adopt new technologies should consider the **expected** and **unexpected** consequences that any new technologies would bring. This is an important step in deciding whether or not to implement a new technology, as the consequences can have either a **negative** or **positive** effect in any of the four main areas listed above. It is important that the review of negative and positive consequences

is conducted as part of a risk assessment, and that the outcome is used as an important factor in the final decision to either deploy or not deploy.

Management must be able to assess the impact that the technology will have by balancing the positive and negative effects on performance. Whether the technology being deployed is a cloud-based wiki for team working, or a SAP fulfilment system, the technology can necessitate the re-thinking of significant aspects of how the organization is aligned. In particular, the adoption of new technology can impact the following aspects of alignment:

- Resource allocation
- Skills requirement
- Staffing levels
- Capability prioritisation

A failure to assess the impact will result in unnecessary redundancies in terms of how resources are managed and aligned. This in turn will result in avoidable costs being incurred by the organization. Therefore, organizations planning to adopt new technologies need to have a good reason to do so. Some of the more common reasons for organizations to consider upgrading their technology assets could be as follows:

- Legislative requirements
- Reducing cost
- Maintaining a competitive position
- Responding to customer needs
- Compensation for skills shortage
- Enabling scalable processes
- Developing responsive business processes
- Reducing security risks
- End-of-life technology

However, for all the good reasons to adopt new technology, there are also good reasons not to adopt it.

- The cost maybe prohibitive.
- Requiring new skills
- Potential security/stability risks
- Existing technology works
- Changes to work contracts

- Disruption to customers
- Disruption to core processes

Once an organization has weighed up the reasons for and against adoption it must then consider the organizational factors that may conspire to prevent a successful implementation. These factors or barriers can be broadly broken down under the headings, **Technological, Organizational**, and **People**. By understanding how these barriers manifest themselves, an organization will be better placed to manage them, and therefore, successfully deliver the implementation of technology.

8.4 Case Study: FoxMeyer's Distribution Disaster

Back in the early 1990s FoxMeyer was one of the largest pharma wholesalers in the US. The company had annual sales of approximately $5 billion USD with company offices and distribution centres located throughout the US. The problems started when FoxMeyer decided to update the IT systems used to support and control their distribution centres. In effect, the company was embarking on a new ERP system to help streamline their supply chain and drive better process efficiencies. As part of the supply-chain improvement the company was also investing in developing a highly automated distribution centre in Ohio.

The company was convinced that the improved supply chain would drive significant efficiency gains. The problem was that even before the IT upgrade was complete FoxMeyer was using the planned savings to shape their pricing strategy for future contracts. Without doubt, this was a very large ERP implementation, and the selected contractor chosen to implement the ERP system was a relatively new organization called SAP. In 1993 the project, named Delta III, was given the go-ahead, and SAP was engaged to develop an ERP solution based on the SAP R/3 platform. During the early 1990s an ERP implementation such as this one was relatively rare, and this was perhaps one of the first projects of this size and type for SAP. FoxMeyer also purchased a warehouse automation system from Pinnacle, and then engaged Andersen Consulting to integrate and implement the two systems.

By 1995 the Delta III project had moved into the implementation phase. During this period a level of distrust was growing amongst FoxMeyer's warehouse employees. The Pinnacle warehouse system and SAP R/3 integration were beginning to make employees nervous. There was a growing fear that the new system would mean redundancies for many of the employees. This fear and distrust started to manifest as damaged inventory and incomplete orders. This resulted in $34 million USD of missing or damaged inventory even before the project went live.

However, there were other technical problems looming for the project. A significant issue that had not been addressed was that FoxMeyer's legacy systems were able to process over 400,000 customer orders each night. The problem was that no one had spotted a potential bottleneck in the SAP R/3 system that limited the number of orders to 10,000. This oversight only highlighted the shortage of skilled and knowledgeable people involved in the project. Although at the height of the project there were over 50 consultants at FoxMeyer, many of them were inexperienced, and turnover was high.

But the order processing system wasn't the only issue. The distribution centre's automation system was also a disaster. As the warehouse automation system came online, the Ohio distribution centre was one of the most highly automated facilities in the US. Unfortunately, nothing much worked right. The automation controls had constant bugs, and FoxMeyer had to deploy hundreds of workers to work around the issues. "The underlying software would fail in the middle of the process, so we'd have to stop and restart in the middle of intense picking hours," said one logistics executive.

The problems began to snowball between the combined system issues. An order would be partially shipped due to distribution centre problems. Customers would receive a partial order, and call to complain. Unable to see if the rest of the order had shipped on a later truck, the customer service rep would authorise a replacement shipment for product that was already on its way to the customer. Tens of millions of dollars in unrecoverable shipping errors ensued. This was on top of the cost of inventory lost or damaged due to employee discontent.

The costs associated with the project were escalating beyond a point where the new ERP system was providing value. FoxMeyer had bet a lot on the Delta III system and was expecting significant savings in costs; savings that it was hoping would make them more competitive. With the eventual cost of the project coming in at just over $100 million USD, FoxMeyer's planned narrow margins and potential profitability were gone.

In 1996 FoxMeyer filed for bankruptcy, and was bought by McKesson Corporation for the bargain price of $80 million USD. This was a significant devaluation for a company that had been valued at $5 billion USD less than three years previously.

Questions:

1. The intentions of the FoxMeyer management team were good in that they realised technology could improve the efficiency of their core supply-chain processes. However, did they fully consider the implications this project would have on the workforce?
2. What barriers do you think had a significant influence on the outcome of the Delta III project?
3. For all the good reasons to adopt the new technology, what reasons should have been considered for not adopting the technology?
4. The adoption of any new technology will have a significant impact on resources, skills, staffing and capability levels across the organization. Do you think FoxMeyer could have ensured a smoother deployment of Delta III if it had considered any of these? And if so, how?

8.5 Review Questions

True/False Questions

8.1 Technology can have a significant impact on work practices. T or F?

8.2 The handling of the adoption of technology should be left solely to the IT function. T or F?

8.3 Technology can influence the quality of decision-making across an organization. T or F?

8.4 Technology will help to transform bad management practices into good management practices. T or F?

8.5 Having the latest technology will always put an organization out in front of the competition. T or F?

8.6 Unexpected consequences of technology will always be negative. T or F?

8.7 Expected consequences will always outweigh the impact of unexpected consequences. T or F?

8.8 Unexpected consequences can have either a negative or positive impact on the organization. T or F?

8.9 Technology's ability to automate work processes is an example of changes to work practices. T or F?

8.10 Technology can cause a shift in political power across an organization. T or F?

8.11 Improving governance is a way of re-balancing power in a positive way across an organization. T or F?

8.12 Hofstede's research looks specifically at how technology influences culture. T or F?

8.13 Organizations can develop cultural norms and practices of their own. T or F?

8.14 According to Quinn *et al.* (2003) there are four basic cultural types for organizations. T or F?

8.15 How workers see technology impacting their culture will have no effect on whether they adopt the technology or not. T or F?

8.16 Technologies based on cloud technology are changing the way people interact with organizations. T or F?

8.17 Technology adoption can have a significant impact on resource allocation across an organization. T or F?

8.18 Technology can influence which capabilities become a priority for the organization in building a sustainable competitive advantage. T or F?

8.19 Responding to legislative directives may be a good reason to adopt new technology. T or F?

8.20 Sticking with existing technology because it still works is not a good reason for not adopting new technology. T or F?

Multiple Choice Questions

8.21 Which of the following is not a form of socio-technological interaction?

A. Work practice
B. Decision-making
C. Political boundaries
D. Data analysis

8.22 Which of the following would normally be considered a negative unexpected consequence of a technology deployment?

A. Having more time available for other tasks
B. Reduced dependency on certain skill sets
C. Reduced morale due to concerns over growing uncertainty
D. Reduced need for office space

8.23 Which of the following benefits will have the least impact in terms of reducing the imbalance of power across an organization?

A. Improved data processing speed
B. Improved decision-making
C. Improved transparency
D. Improved governance

8.24 Which of the following is not one of the components of Hofstede's (2001) cultural view?

A. Long-term/short-term orientation
B. Aggression – submission
C. Uncertainty avoidance
D. Power distance

8.25 Quinn *et al.* (2003) identified four basic types of organizational culture. Which of the following is not one of the four types?

A. Closed system
B. Human relations
C. Internal process
D. Rational goal

8.26 The use of algorithms for low-level decision-making is best suited to which knowledge transfer behaviour?

A. Innovation
B. Standardisation
C. Control
D. Empowerment

8.27 Which of the following is technology least likely to influence?

A. Transparency of information
B. Clarity of information
C. Analysis of information
D. Quality of a decision

8.28 Which of the following is a good reason for not adopting a new technology?

A. Maintaining competitive position
B. Reducing costs
C. Requirement for new skills
D. Compensating for skills shortage

8.6 Review Question Answers

True/False Answers

8.1 T, 8.2 F, 8.3 T, 8.4 F, 8.5 F, 8.6 F, 8.7 F, 8.8 T,8.9 T
8.10 T, 8.11 T, 8.12 F, 8.13 T, 8.14 T, 8.15 F, 8.16 T
8.17 T, 8.18 T, 8.19 T, 8.20 F

Multiple Choice Answers

8.21 D, 8.22 C, 8.23 B, 8.24 B, 8.25 A, 8.26 B
8.27 D, 8.28 C

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Chapter 9: Enhancing the Customer Experience through Technology

Learning Objectives

On successful completion of this chapter the student will be able to:

- Explain the difference between a goods-dominant and a service-dominant approach to technology enabled service development.
- Describe how technology can be used to support the creation of customer-centric products and services.
- Describe how the nature of service has change in recent years and the role technology now plays in delivering competitive service offerings.
- Describe how to ensure the customer is at the centre of the development process.
- Explain how the technology acceptance model can be used to assess user acceptance of new technologies.

9.1 Introduction

As organizations use technology to increase their interaction with customers the "user" experience with technology becomes a key factor in building customer satisfaction. So much so, that in many cases the quality of the user interface can impact the customer's decision to repeat the interaction process, irrespective of the quality of the product/service being accessed. Because of the importance the customer experience can have on repeat business, getting the interface right becomes crucial. However, the quality of the interactive experience is not just impacting the external end user or customer, but can also affect the way internal end users, or employees, interact with internal systems.

The development of effective user interfaces can make the difference between a successful sale or a customer moving away to another site, changing their online banking, or switching to a more easily accessed product or service, even if it is inferior to the previously preferred option.

With continued growth in world-wide access to the internet through an expanding array of technologies (computers, phones, tablets, watches, TVs, etc.), end users don't want to have to learn new ways of engaging with organizations – they just want to be able to interact as and when, and how they like. This poses a challenge for many organizations in terms of security of access (refer to Chapter 11: Securing your Information in a World of Open Access, for more on security), providing an intuitive interface, and also providing a unique and distinguishable experience. These challenges are also equally valid for the internal end users of an organization's information systems. With the blurring between personal and work-based technologies, many employees are accessing information systems through their own technology. As a result of this the growth in "bring your own device" (BYOD) means organizations don't have the same level of control over how internal and external users connect to their systems.

Because of the increase in global competition, users don't have to tolerate badly designed systems or interfaces. Due to high levels of competition, users can shift relatively easily from one product or service provider to another. Therefore, organizations need to be able to respond quickly to user requirements and feedback. Ensuring a successful interaction between both internal and external end users and the organization's information systems is not just dependent on the quality of the organization's technical people, but on the manner in which end users are integrated into the development process. This chapter will look at the basic underlying principles and methods (and barriers) for building end-user feedback into system development.

9.1.1 Placing the End User at the Centre of What We Do

This is not a new concept. Many organizations realise the importance of delivering products and services that are in tune with what their customers are looking for. However, some organizations still take a Fordist approach to product and service delivery: the customer can have it in any colour as long as it's black. Thankfully, many organizations have woken up to the realisation that this approach is not sustainable in a highly competitive market. If the customers don't like what you're selling they'll simply click on another website to get a better deal. The unfortunate thing about this, is the customer no longer needs to go far in search of alternatives. They no longer need to take time off work to look up and down the high

street for an alternative product or service – they don't even need to get up off their sofa. Technology has opened up access to suppliers from all over the world. With access to an internet-enabled smart device you can find anything you want at a competitive price, pay for it and have it shipped to you directly from anywhere around the world. All whilst sitting in your local coffee shop drinking a latte, irrespective of the time of day, or day of the week.

Because of this ease of access, smart and competitive organizations understand that they need to be sensitive to the needs of their customer base. If they get it wrong, their customers will shop somewhere else. Organizations can no longer simply adopt a low-cost strategy (refer to Chapter 4: Building a Digital Business Strategy) to keep customers coming back. There will always be someone else, usually in a lower cost economy, who can offer a similar product for a lower price. Therefore, a low-cost strategy is no guarantee that an organization will maintain its customers in the face of growing global competition. So, how do you keep customers loyal and reduce the impact of low-cost substitutes within the market? This has been a significant challenge for the banking sector within the UK over the last decade. The old business model back in the 1980s and 90s for securing a bank loan was for an individual to take time off work to arrange an appointment with their local bank manager to discuss a loan. The individual would then have to physically visit the bank to discuss the terms and seek approval. This could take a couple of visits before getting the final approval and the release of the additional money into their personal account. Roll forward to the first decade of the 21st century. The same individual needs a car loan to replace their aging and dilapidated car. They are standing in a queue at Tesco (or some other large retail outlet) and see a form for a personal loan at the checkout. All they need to do is fill in the form, or go online and fill out the form, submit it and have a decision on their eligibility within minutes. They don't need an account with the lending agency, or need to take time off work to go and see their bank manager. This type of financial service offering has had a serious impact on the private banking sector within the UK, and has resulted in the development of more customer-centric services.

Banking is not the only sector to realise the importance of the potential role of the customer in terms of the development and delivery of products and services.

Sector	Organization	Customer focus
Banking	HSBC	From physical to online account management via secure laptop/tablet/smart phone applications. Allows the customer to access their banking services as and when they want to.
Book/Media	Amazon	From physical books to electronic downloads, and the recommendation of items of interest based on previous shopping experiences. Reduces the time taken for customers when looking for similar products and services previously purchases.
Entertainment	Netflix	Using the customer viewing history to identify and present recommendations. This reduces the time the viewer needs to search for their preferred viewing options. It ensures Netflix is also presenting content that continues to be of interest to the viewer.
Retail	Tesco	Provision of online grocery shopping that can be scheduled for delivery at a time convenient for the customer.
Travel	British Airport Authority (BAA)	Now provides support services for travellers passing through Heathrow, and other major UK airports. These services, such as group and individual fast-track security and boarding, wheelchair assist, car valeting, and fast-track parking are designed to make the airport experience less stressful for travellers.

Table 9.1: Changing Focus

The ability to align the organization's products and services with what the customer is looking for has seen many new organizations become very successful over the past few years. The old paradigm where size matters has been brushed aside by smaller more agile organizations that are better able to connect with their chosen customer base. Organizations such as Facebook, Google, Uber, Twitter, Udemy, and Instagram (owned by Facebook) are well known names and are seen as dynamic, flexible, and responsive. How long they stay that way is a matter for their own internal senior management teams, but be assured that in five years from now there will be another set of dynamic, flexible, responsive organizations ready to challenge the top spot in their respective industrial sectors.

One thing, however, that these and future successful organizations have in common is the way the customer is placed at the centre of their product and service development programmes. It is when the customer no longer holds this position that the organization will start to see its competitive position deteriorate. The main driving question is no longer "*what can we sell to the market?*" but "*what does the market need?*" This is the basis for the development of an organization's service orientated perspective, and as shown by organizations such as Netflix, Google, Microsoft, and Amazon, technology is well placed to help build and support this new competitive perspective.

9.1.2 Developing a Service Orientated Perspective

Over the last few decades of the 20th century there was significant growth in the number of people being employed in the service sector, as opposed to manufacturing or agriculture. This is a trend that has continued to increase at a global level where the increase is more noticeable in well-developed economies with an increasing percentage of GDP (Gross Domestic Product) linked to service-related activities (Figure 9.2).

Table 9.2 shows that industrialised nations are experiencing increased growth in employment in service-related jobs. This growth is also seeing an increase in service-related GDP activity. But what does this growing service industry look like? When we think of service what do we think of? Is it waiters, domestic cleaning staff, or similar relatively low-paid activities? Surely the number of people going into domestic service isn't going to push up national GDP?

	1980	1987	1993	1999
USA	67.1	71	74.3	**80.4**
Canada	67.2	70.8	74.8	**73.9**
Japan	54.5	58.1	59.9	**72.4**
France	56.9	63.6	66.4	**70.8**
Italy	48.7	57.7	60.2	**61.1**
China	13.1	17.8	21.2	**26.4**

Table 9.2: Percentage of Employment in Service Jobs 1980-1999 (UN, 1999)

The types of roles and activities involved in services have changed significantly over the last few decades. Access to information and knowledge has seen the development of knowledge intensive services. These services centre around high-value information and knowledge sharing activities such as financial investment and management, engineering and business consultancy, IT service management, design consultancy, and health care provision, to name but a few. What differentiates these knowledge intensive services from the more traditional view of service is the provision of specialist knowledge that is necessary to deliver the service, as opposed to the ability to physically carry out certain manual or semi-skilled tasks. In effect, the greater the knowledge of the individual relating to the service in question, and assuming supply is not greater than demand, the higher is the salary the individual will be able to demand (assuming also that the market is not subject to over-regulation).

Growth in the knowledge-based economy has had a significant impact on the IT sector. Many providers of technology in the 1980s and 90s began to realise that they needed to differentiate their offering in a growing competitive market. Technology was becoming a commodity with little to really differentiate it other than cost, or the price to the end user. Companies such as HP and IBM began to realise that they could not win a price war with other competitors such as Acer, Dell, Fijitsu and other PC manufacturers. They needed to differentiate themselves on something other than cost, and as the components in most computers were becoming more common across most PC manufacturers, differentiating on quality alone was not going to be easy. At the same time as the growing price war between computer manufacturers there was an increasing need for better technology/business integration amongst organizations struggling to engage with and develop improved internet ready business processes. Companies no longer simply needed technology, they now needed to understand how

to better integrate and align technology to their business strategies and models. This required a different set of knowledge related skills for those organizations looking to move from being a provider of technology to a provider of bespoke business information systems. This is a transition that organizations such as IBM and HP have made. But this shift to being more of a service provider than a hardware provider is not limited to computer manufacturers alone. The transition has happened in a number of sectors. Table 9.3 identifies a number of organizations that have developed knowledge intensive service offerings. In the right-hand column the text highlights the increased value that these services now bring to the organization.

Sector	Example	From	To	Increased value-add
Manufacturing	IBM	Manufacturer of computer technology	Business/technology integration specialists	Helping organizations to align technology in a way that helps to achieve their strategic objectives.
Financial	Lloyds Bank	Personal banking services	Financial management services	Providing information on budget management, savings investment, assurance and wealth management through online and physical channels.
Travel	P&O Ferries	Foot and car passenger ferry service	Relaxing short travel breaks	Provide on-board services to help travellers unwind and relax during their short trip.
Healthcare	National Health Service	Treat the disease	Treat the person	Develop a more holistic approach to personal long-term health.
Media	BBC	Analogue TV, radio services	Digital services	The consumer, based on their personal preferences, can customise services.

Table 9.3: Industry Sector Knowledge Transition

A few interesting points are worth noting in the transition to more knowledge intensive services.

- Organizations developing knowledge intensive services need to understand customer requirements.
- Technology can help in connecting and supporting customer service requirements.
- Knowledge becomes a key competitive factor as long as the consumer of the service experiences the knowledge through some transfer mechanism.

Technology can aid an understanding of the competitive environment and customer requirements through better data access and analyses. Technology can also help to establish multiple communication access points between the organization and their customer base (mobiles, phones, kiosks, tablets, etc.). However, technologies alone will not improve a poor service offering. The development of the service must still conform to the most fundamental of truths – if the service is not what the customer wants or needs then no amount of technology will improve its demand. Unfortunately, many organizations still produce their products and services in this way. They build the offering and then look for a market to sell it in. Considering the levels of competition being experienced in most markets, to stand any chance of success the products or services must consider the views, opinions, and requirements of the customer base. This understanding is what differentiates a goods-dominant logic from a service-dominant logic perspective.

9.1.3 Service-dominant Logic v. Goods-dominant Logic

The notion of services as a means of economic exchange is not a new one. The contribution of services to the economic growth of a nation was considered as early as the late 1800s by Adam Smith. To get an overview of services thinking in academic disciplines that highlight the post-1800s, it helps to look into the ongoing debate of *goods vs. services* from both a marketing and economic perspective and a social and management point of view. This is an important distinction to make, as technology will impact both the delivery of the service and the actual service itself in different ways.

Vargo & Lusch (2004) summarise the debate of goods versus services as a primary economic exchange by dividing it into the following broad periods of marketing thinking. These periods are identified below with the dominant characteristics listed under each respective period.

1. **Classical and neoclassical views [1800s]**
    1. Value embedded in matter (good-centric view).
    2. Wealth created by acquiring tangible things.
    3. Marketing is matter in motion.

2. **Early formative marketing [1900 to 1950]**
    1. Characteristics of goods.
    2. The marketing institution's role is to embed value.
    3. Transaction and output are key factors.

3. **Decision marketing schools [1950s]**
    1. Marketing as a decision-making activity.
    2. Four Ps: product, place (distribution), promotion, and price.
    3. Optimality of decisions.

4. **Marketing management and experts [1970s]**
    1. Determine a company's marketing decision variables.
    2. Maximise a company's objectives in the face of non-controllable demand variables.
    3. Relationship marketing.
    4. Quality and resource management.
    5. Supply and value chain management.

5. **Customer fulfilment and satisfaction [1980s]**
    1. The primary motivation of services is to achieve high customer satisfaction.
    2. This leads to assuring service quality attributes that are important to customer segments.

6. **Services dominant logic [2000s]**
    1. Everything is seen through the services lens.
    2. Products are the materialization of knowledge sold to consumers to satisfy a service need.

Fitzsimmons and Fitzsimmons (2003) take a complementary view of the evolution of services by considering the stages of development of societies. They highlight three periods:

1. **Pre-industrial society**
    1. The population tries to survive against the forces of nature.
    2. Technology has very low impact or is non-existent.
    3. Societies are agrarian and structured by traditions.

2. **Industrial society**
    1. The production of goods dominates economic activities.
    2. The quantity of produced goods is the primary factor.
    3. Labour unions help to regulate social life and rights.

3. **Post-industrial society**
    1. Quality of life is the most important aspect of day-to-day activities.
    2. Information is the key resource.
    3. Services that improve life activities such as health-care and education are paramount.
    4. Dominance of jobs in the service sector such as knowledge workers with professional and technical skills.

The following diagram (Figure 9.1) provides a visual representation of both views. The timeline is not to scale, but the diagram demonstrates the complementarity of both views. The top part of the timeline represents Fitzsimmons and Fitzsimmons (2003) and below the timeline is represented by Vargo & Lusch (2004).

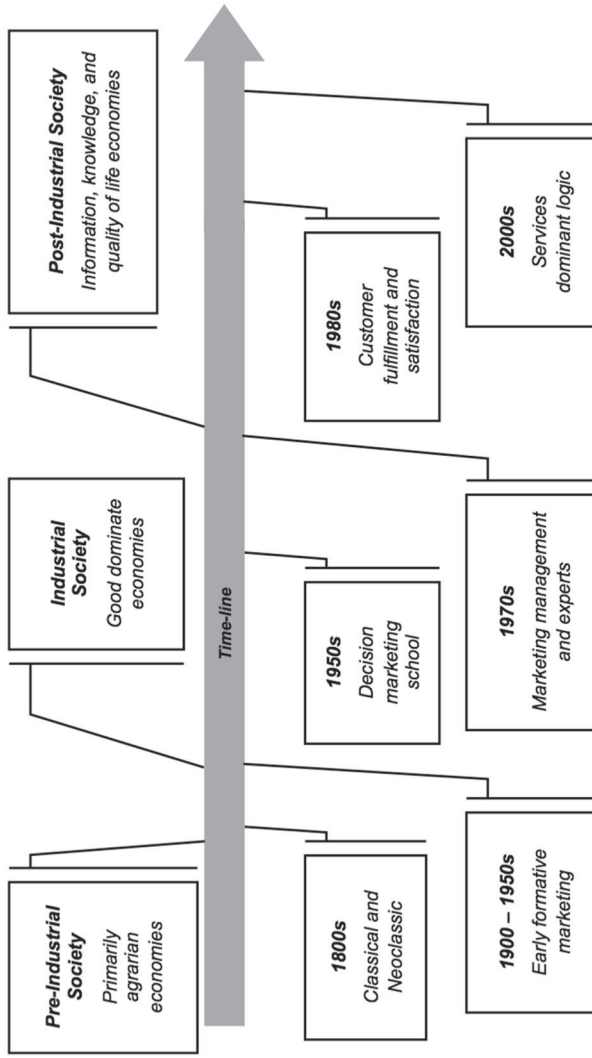

Figure 9.1: Economic Evolution of Services

According to Fitzsimmons & Fitzsimmons (2003) we now find ourselves in a "**Post-Industrial**" society. Within this society the economic drivers are information and quality of life, the dependence on information and

knowledge, and growth in the demand for knowledge workers (refer to Chapter 7: Using Technology to Support Knowledge and Innovation). At the same time, Vargo *et al.* (2004) point to the growing importance of the customer in the development, delivery, and demand for products and services.

When Vargo *et al.* (2004) talk about service-dominant logic they are referring to the way in which organizations view the development, delivery and consumption of both physical products and services. By viewing both products and services through a "services lens" Vargo *et al.* (2004) identify a subtle but significant shift in the focus and alignment of the organization.

Logic	Organizational Focus	Impact
Goods Dominant	Build a product/service and then "sell it" into the market.	Dependent on marketing/sales campaigns to sell the benefits of a product/service to customers.
Service Dominant	Work with customers to identify a need for a product/service and then develop in collaboration with consumer groups.	A product/service is developed for a primed market. Customer expectation and demand are built up before the product/service is launched.

Table 9.4: Goods versus Service-dominant Logic

Service-dominant logic requires an organization to change in many ways. The shift from being a traditionally inward-looking organization to being an externally focused organization that actively seeks to collaborate and engage with customers, through the service and product development phase, can mean significant cultural and structural changes across the entire organization. Once again, this is an area where technology can help organizations to develop a service-dominant approach to services and product development, delivery, and consumption.

According to Vargo *et al.* (2004) the service-dominant approach is underpinned by three core concepts. These are:

- **Co-creation of value**
  - This is the idea of the customer as a co-producer of the value extracted from the service system.
  - The customer provides input to the service process.

- **Relationships**
  - The relationship with the customer is of paramount importance and a source of innovation and differentiation.
  - Long-term relationships facilitate the ability to tailor the service offerings to the customer's needs.

- **Service provisioning**
  - Service capacity is provisioned to meet fluctuations in demands while retaining quality of Service (QoS).
  - QoS is defined mainly from the perspective of the customer.

Once again, technology can play a significant part in helping organizations to realise these concepts in pragmatic and practical ways.

Core Concept	Enabling Technology	Examples
Co-creation of value	High-speed broadband. Interactive product websites. Product beta-test sites.	YouTube clips of customers using products in new/innovative/interesting ways. Providing beta product for free download for evaluation.
Relationships	Social media sites. Website customisation and personalisation technology.	Building a relationship around a common interest with the customer/user. Such as Facebook, LinkedIn and other social media sites. Product personalisation from Amazon, Netflix, etc.
Service provisioning	Cloud storage technologies.	Using third-party cloud service providers (Amazon, Microsoft, etc.) to accommodate increases/decreases in demand for computing and/or storage capacity.

Table 9.5: Technology Support for Service-dominant Logic

As Vargo *et al.* (2004) point out, the quality of service needs to be evaluated from the customer's perspective. In order to ensure new products and services are meeting the required quality levels, organizations are looking for more innovative ways to provide services to their customers. This notion of **service innovation**, where organizations strive to continually create new, unique, and relevant products and services is a critical capability for today's post-industrial organization.

9.1.4 Using Technology to Support Service Innovation

From our understanding of **service innovation,** we can see that innovation in services is much more than the application of information technology (IT). The disappointing return on IT investment from the 1970s to the early 1990s has resulted in a widespread debate about its causes and potential solutions; the so-called "**productivity paradox**" in services. This is a concept developed by Brynjolfsson (1993) which refers to a perceived failure of technology to deliver increased economic or productivity returns. The failure of technology to provide the promised gains was highlighted and identified especially during the period between the 1970s and the mid-1990s (Solow, 1997). However, there was a marked resurgence in productivity gains from 2000 onwards, and technology was once again seen to be playing a significant role. Some of the reasons being proposed to explain how technology was now adding value were as follows:

- **Improvement in user interface design:** This is making it easier and more intuitive for users to connect with technology.

- **Moving to computer-based practices:** There were many organizations running manual paper-based and computer processes simultaneously. Reducing the paper-based processes freed up more time for more value-added activities.

- **Selecting appropriate technology:** The growing realisation that having the latest, and in some cases unproven technology, was not as good as having the most appropriate technology.

- **Shifting the focus of technology:** Many organizations invested in technology that was not directly linked to productivity, such as presentation and work processing software. These technologies certainly helped speed up work processes, but didn't necessarily

improve them in terms of their effectiveness. Using technology to improve business processes was a key step in improving productivity.

- **Connecting technologies:** Many industrial processes had already been automated by the 1990s. The addition of computer-based controllers simply improved the effective control of production lines, but didn't really improve production throughput. However, the use of technology to connect enterprise systems such as logistics, fulfilment, finance, order management, stock management, and manufacturing saw a major improvement in the capacity to effectively handle significant increases in customer demand.

Advances in internet enabled technologies have also enhanced technology's ability to support improved productivity gains. Access in terms of cost, accessibility, and location means organizations can adopt and connect technologies quickly and at a relatively low cost. This has the disadvantage that, unless the technology is proprietary, enabling technologies are easily available to all – including new and existing competitors. Therefore, there is a realisation that although technology will certainly help to get an organization into the competitive market place, it can't guarantee it will keep it there. For ongoing competitiveness, the organization must consider how to best engage with and build a sustainable relationship with their customers. Technology once again can help here if applied in an appropriate manner. Because of this, a key question for many organizations in highly competitive markets is…

How can they continue to develop competitive innovative services and products, and how can technology be better used to do this?

However, as discussed in Chapter 7 (Using Technology to Support Knowledge and Innovation), organizations (see Table 9.6) need to view innovation in a much broader context than just technology. By not looking at any one aspect in isolation, but considering technology, culture, management practice, knowledge transfer, and market forces together, the concept of service innovation becomes an organization-wide activity.

Organization	Product/Service	Innovative approach	Competitive position
Rolls-Royce	Aero-engines	Shift from selling "engines" to "thrust".	Airlines lease engines from Rolls-Royce, who monitor, manage, and maintain performance. A customer does not need to develop specialist knowledge of engines, or a capability for engine maintenance.
Microsoft	Office 365	Shift to a cloud-based office suite.	A customer no longer needs to download and maintain software on their computer. Functionality can be purchased as and when the customer needs it. Compatibility issues are largely resolved without customers needing to concern themselves with any technical issues.
Nikon	High precision, integrated circuit etching equipment	Customer buys capability to etch, and not the equipment.	IC etching equipment is very expensive. Nikon will maintain, service and replace the equipment without the customer seeing any deterioration in the ability to etch. The customer effectively is paying for the number of ICs etched as opposed to the actual etching equipment.
Prezi	Cloud-based presentation software	Free application that is platform independent.	Customers can access the application for free to create nonlinear flow presentations allowing for a more dynamic form of presentation.

Amazon	e-Books	Customer can instantly access books and magazines.	Amazon uses technology to provide customers with a robust e-Reader device (Kindle) that supports Amazon's eBook format.

Table 9.6 Service Organizations

Today's leading service organizations operate on a global basis cooperating with customers, suppliers, partners and a multitude of stakeholders to deliver service and/or product packages. It is the complex supply chain that delivers the service or product, and not any single business function or unit (McLaughlin *et al.,* 2006). Therefore, service innovation must come from within, and across the supply chain or network. Organizations must engage their knowledge workers from across all aspects of the business and support them in connecting with end users or customers, to better sense their service requirements.

The role that technology can play will become clearer by understanding how the organization supports the innovative process through the creation and sharing of information and knowledge. From this position, organizations will be better able to stimulate meaningful innovation and business value (Herreld *et al.,* 2007). Certainly, technology plays an important part in the development of innovative service and product offerings for successful service organizations. It is vital to understand customers' needs in terms of how they want to interact, use, or consume the products or services, and even how they see those products and services supporting their own business requirements. Therefore, an important place to start is developing a clear understanding of end user or customer requirements, and then creating innovative services and products to meet those requirements.

Time Out

Think about it: What's the focus?

Annika Junichi is the marketing manager for APOS Fitness Co. which makes fitness equipment for home and commercial gym use. The

company was founded twenty-five years ago and has seen steady growth over the last fifteen years. The increase in demand for APOS' products has resulted in the company doubling its employee numbers, and maintaining a steady two-digit profit level for five years.

The company has a mixed channel strategy where it sells directly to large commercial clients, and uses retail partners to sell on equipment to home users. Over the last five years this channel strategy has worked very well. However, Annika and Jonathan Swift, the CFOs, think that a direct sales model, where APOS sells directly to home users, could be more profitable. Jonathan thinks that if they replace their chain of retail partners with an online shop, they could significantly increase profitability.

Amy Chan, the CEO, is very interested in further investigating this option and has asked Michael McGuire the IT manager to give his opinion on how technology can add business value to Annika and Jonathan's plan.

Michael gives the plan some thought, and then presents his findings at the weekly senior management meeting. Michael believes he could have an e-commerce front-end developed for the current corporate website that would allow users to view the current range of equipment and place an order. However, initially the site would be restricted to accepting orders in certain currencies, from certain geographical regions, and in certain languages. This could be expanded over time once demand had been assessed, and cross-border tax issues had been resolved. But basically, they had access to the necessary technology to start selling online.

Denis Norton, the sales manager, has some reservations though. Denis believes the reason for APOS' success is largely down to the relationship they have developed with their channel partners. A lot of work has gone into giving the channel partners incentives to push APOS products over other well-known competitor brands. Denis is worried that if an online sales system is developed APOS may not see a successful and comparative level of sales coming through the online channel. Denis looks around the table at the other senior managers and gets the sense that they (the manufacturing, development and distribution managers) are not being engaged in this discussion and the feeling is that this is really just a marketing and finance issue… However, Denis still thinks this issue is bigger than just marketing and finance.

Questions:

- Do you think Denis is right to think the decision to shift to an online sales platform needs to be opened up for wider discussion? If so, who else needs to be part of the discussion and why?
- Technology will provide APOS with the ability to under-charge their channel partners without impacting profitability. So, what could possibly be the downside of going with this option?
- Technology can certainly help customers to access product information, pricing, and availability. But how can technology build a sustainable relationship between APOS and its customers?
- Is providing an online capability enough to develop a competitive advantage in today's market? How else can technology be used to develop a unique and sustainable offering – not just to online customers, but also to existing commercial and channel retail partners?

9.2 Designing User-centric Systems

A key aspect of designing any interactive system is to understand the main use that the system is there to carry out. What is the reason for the system? Is it to control and standardise the format in which information is input to the system? Is it to streamline core business processes? Is it to educate and teach in a way that challenges and motivates use…or is it for some other reason? All of these reasons are valid but must be understood before any development starts, as each reason will drive different design parameters, and system functionality. For example, the interface for a customer order management system will be quite different to that of an online learning environment, such as Coursera's online learning course website. Sharpe *et al.* (2009) believe it is helpful to consider two factors when considering the objectives of any system development: **Usability Goals** and **User Experience Goals**. Usability goals are concerned with meeting specific usability criteria such as:

- Effective to use (effectiveness)
- Efficient to use (efficiency)
- Safe to use (safety)

- Having good utility (utility)
- Easy to learn (learnability)
- Easy to remember how to use (memorability)

However, user experience goals are less specific and mainly concerned with the experience of the user. For example, was the interface nice to use? Was it visually pleasing to look at? Although these goals are more subjective in nature than the usability goals, they will impact the way end users accept and interact with the technology. Therefore, it is important to try and identify what experiences will shape how end users will feel about the systems being developed. Some examples of user experience goals could include:

- How satisfying is it to use?
- How enjoyable is it to use?
- How exciting is it to use?
- How entertaining is it to use?
- How helpful is it to use?
- How much fun is it to use?
- How boring is it to use?
- How thought provoking is it to use?
- How safe is it to use (protecting personal data)?
- How reliable is it to use?

When we think about the user interfaces and systems that we use on a daily basis we expect different experiences from them. Such as the experiences we get from online banking, online gaming, email, smart phone interfaces, social networking, and our work information system interfaces. All are designed for different types of engagement, and all are driving different user experiences. Irrespective of the designed functionality of any system, if the user experience and usability goals (of which there may be more than one) are not accurately assessed, the system will struggle to gain acceptance with the desired user group. Therefore, the process of interactive design becomes an important part of developing technology that will resonate with the needs of the end user.

9.2.1 Engaging Users in the Design Process

There are many aspects of applied design thinking across all functions of an organization. These may include software design, product design, graphic design, process design, service design and business model design. All of these types of design thinking are focused on delivering very different processes, products and services, and will have very specific methods and tools developed to help standardise, speed up and simplify their respective design tasks.

However, all of these design approaches will share three basic fundamental activities:

- **Understanding the requirements:** What does the end user want to be able to do with this product or service? How is it expected to function, and under what conditions? For many products and services, the price that the end user is prepared to pay will also need to be considered as part of the requirement gathering activity.

- **Developing a design that satisfies the requirements:** Developing a prototype of the product or service that meets the requirements of the end user. This will also include an assessment of cost versus price to assess the economic price point for the product or service.

- **Evaluating the design:** How well does the product meet the end-user requirements? What compromises have been made with the design and how will these impact the desirability of the product/service to the market? How well does the product or service compare to existing competitor offerings?

With an **Interaction Design** approach, organizations also ensure the end user or customer is an integral contributor across all three key activities. Interaction design takes a user-centric approach to development. The user is actively engaged with to ensure the requirements are understood from the start of the design process. This can introduce some challenges when trying to balance what the end user wants and is prepared to pay, with what the organization can build and deliver in a cost-effective manner. Therefore, the design process is also about:

- **Managing conflict:** Managing the immediate need for the product and service by the customer, with the timeline necessary to

develop, test, and deliver a product or service without incurring increased costs or lower quality. For example, the customer may expect certain discounts or privileges for contributing to the design. These may include preferred access or control of certain markets.

- **Managing expectation:** Managing what the user is expecting to have by way of functionality when the product or service is finally available. For example, the product or service may only be available in certain languages for the first release, with other languages, services, or functionalities becoming available with future releases.

To help manage conflict and expectation, generating alternative designs is an important part of most design activities. Alternative designs do not have to be sophisticated or interactive. However, they do need to be able to convey the different ideas and functionality inherent in each design. Because of this many interactive designs will utilise a technique called "**storyboarding**" to help convey the look, feel, functionality, and use of a potential design. More details will be provided on the different techniques in section 9.2.2.

9.2.2 Design Life Cycle Models

There are many design life cycle models, and it is not the intention of this chapter to turn you into a software or product designer. However, it is important to know and understand the key stages of an interactive design process. Figure 9.2 outlines a generic and simple interactive design life cycle model (Sharpe *et al.,* 2009).

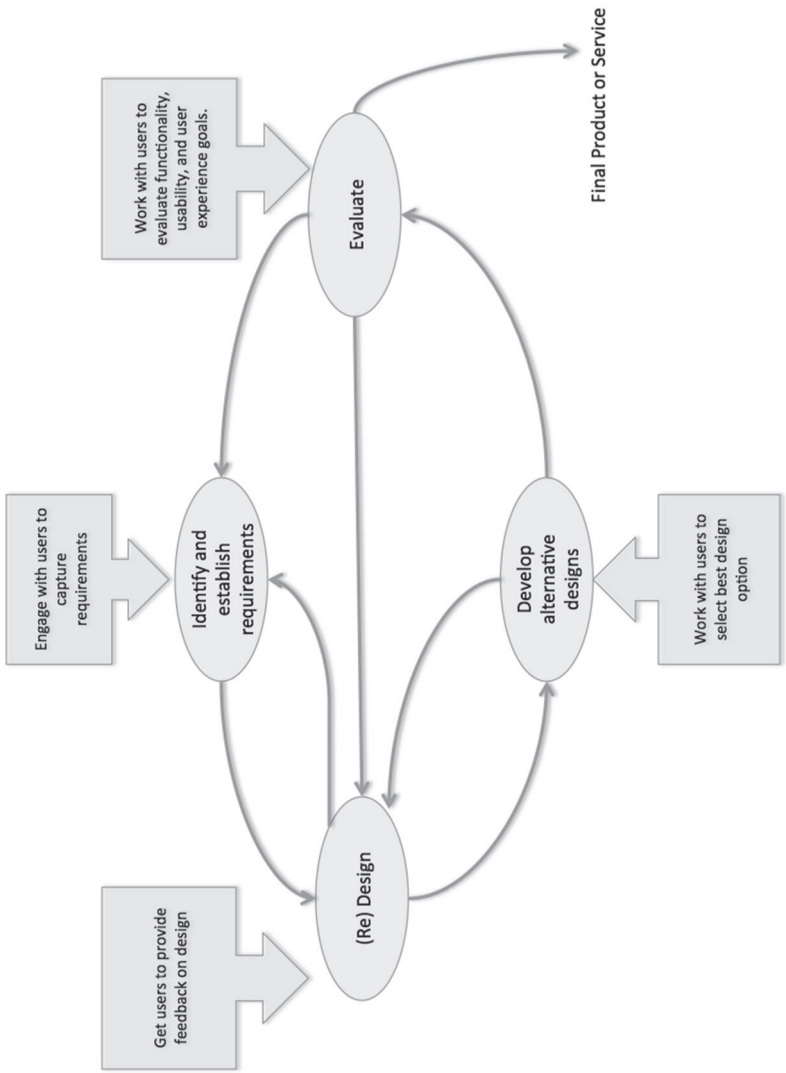

Figure 9.2 Interactive Life Cycle Model (adapted from Sharpe *et al.,* 2009)

This model simply provides an outline of the way in which an interactive design may happen. Design teams are not required to rigidly follow this process, but what it does is show how the main key stages interact with each other. In general, the starting point in the model is usually the evaluation stage. An organization, through its work with its user groups and customers, will become aware of changing requirements. It is at this point that the organization may start to think about updating existing, or developing new products and services. This will lead to a more structured identification of new user requirements. From this point, a new design for a product or service that meets the requirements will emerge. Through an iterative process the design will be refined to a point where it is acceptable to all parties. This is shown by way of the feedback loop between the '(re)design' and 'develop alternative design' stages. The next stage will then see the design enter the evaluation stage. Here the product or service will be fully tested and evaluated against the user requirements. Again, the key aspect of this model that defines it as being an interaction life cycle model is the high dependency on engagement with end users throughout the entire process.

Other design models commonly used in technology development include the **Waterfall life cycle model**, the **Spiral life cycle model,** the **Rapid application development (RAD) model,** the **Agile development model,** and the **Star life cycle model**. All of these models vary in how they are applied but still focus on the three basic fundamental design activities: understanding the requirements, developing a design, and evaluating the design.

9.2.3 Techniques for Testing Concepts

Having collected the user requirements, it is often a good idea to develop a model or **prototype** for testing and evaluation before completely committing to the design. Failure to develop a prototype may result in going into full production or deployment of a new product or service without fully assessing its suitability. By developing a prototype an organization can focus on testing specific aspects of the new design without having to build a complete fully-functioning version of the product in question. That said, it is important to remember that a prototype is a limited representation of a fully working model. However, prototypes can usually be developed in a short period of time, at relatively low cost compared to the full cost of

producing a fully-functioning model, and are an effective way of visualising and testing ideas with different stakeholder groups.

Broadly speaking, there are two types of prototyping; **low-fidelity** and **high-fidelity**. **Low-fidelity** prototyping is quite basic and doesn't usually look anything like the final product. This type of prototyping may use materials such as paper, foam, wood, or clay to build a simple representation of certain aspects of the product. This type of prototyping might focus on representing, in a very basic way, the size, shape, weight, visual representation, or portability of the product. For example, when Apple first started to look at designs for the iPhone, executives and senior managers were give a small piece of wood to represent the size, shape and weight of the phone. The idea was to understand if users would feel comfortable with a phone of that weight and dimension, which was quite different from the existing range of competitive products at that time. Some types of low-fidelity prototyping include:

- **Storyboarding:** This may consist of a series of sketches outlining how the end user would interact with the product or service.
- **Sketching:** A simple visualization technique to help see how a product or service might look to the end user.
- **Simple modelling:** A very basic physical representation of the product which is used to communicate the idea of size, weight, touch, look, and/or feel.
- **Prototyping with index cards:** Using index cards to show how a user will interact with a product or service. This has proved very popular in mapping out how users may interact with websites.
- **Wizard of Oz:** This is where a mock-up working interface is developed. The user interacts with the product or service through the interface, but instead of a computer program responding to the user's requests and commands, a human, who in turn is tracking and responding to the user's inputs, is controlling the interface. This can give a very good insight into how users interact with and navigate through software products and services.

High-fidelity is the other main form of prototyping. In this case, high-fidelity prototypes tend to use materials that would normally be found in the final version of the product or service. Although the inner workings of the prototype may not be the same as in the final version, the high-fidelity prototype will strive to present the user with the functionality that is expected in the final version. There are clear cost implications when

building a high-fidelity model for evaluation. Therefore, it is advisable to always start the prototyping stage with low-fidelity models. This helps to gain a deeper understanding as to how receptive the market will be to the new product or service, what the users will want from such a product or service, and how they will interact with the product or service. Once this is understood, the risk of investing in further development will be reduced if the market is not receptive to the basic idea or design behind the product or service. Rettig (1994) states that it is preferable to start with low-fidelity prototyping for the following reasons:

- High-fidelity prototypes can take too long to build.
- Users tend to comment on superficial aspects of the design (which could have been picked up with a low-fidelity prototype).
- Developers are more reluctant to change something they have invested a lot of time in building.
- A software prototype can set expectations that are too high.
- For software prototypes a bug in the code can cause significant delays in testing, and can impact user expectation.

Table 9.7 shows the relative effectiveness of low- versus high-fidelity prototyping.

Type	Advantages	Disadvantages
Low-fidelity prototyping	• Lower development costs. • Evaluates multiple design concepts. • Useful communication device. • Addresses user interface issues. • Useful for identifying market requirements. • Enables testing of proof-of-concept.	• Limited error checking. • Provides a poor detailed specification for programming. • It is facilitator-driven. • Has a limited utility after the requirements have been defined. • Has limited ability to test usability.
High-fidelity prototyping	• Complete functionality. • Fully interactive. • User-driven. • Clearly defined navigational scheme. • Useful for exploration and testing of functionality.	• More expensive to develop. • Longer lead time to develop. • Not effective for requirements gathering.

• Provides look and feel of final product. • Serves as a living specification. • Can be used as a marketing and sales tool.

Table 9.7: Relative Effectiveness (Rudd, *et al*., 1996)

It is important to remember that no prototype will provide all the answers in designing a successful product or service. Prototyping is about compromise. As can be seen in Table 9.7, the different approaches have different advantages and disadvantages. According to Sharpe *et al.* (2009) the kind of questions or choices that any prototype allows a designer to answer will be limited, and, therefore, the designer must consider the information he or she requires before deciding on the type of prototype to be created.

Time Out

Think about it: Getting connected

UCON Ltd. is an energy management company that has developed technology for installation in private and commercial properties that will help to better manage the cost of electricity consumption. The company is only four years old, and was started by two engineers who previously worked for international electricity supply companies.

UCON's main product is a monitoring panel that can be installed with little or no effort to allow home and business owners to manage their electrical consumption through a number of programmable timers. Users can divide their building into zones and manage lighting, heating, and entertainment to come on or off based on programmable time windows. The product has been a popular hit with both commercial and private users and has seen steady growth over the last three financial quarters.

As with all success stories, word has got out concerning UCON's popularity, and the market for home and commercial energy management has seen a

number of new competitors entering the market. One such competitor is NRG Management Ltd. As the technology behind UCON's system is not new, NRG Management has been able to bring a similar product to market, which is now in direct competition with UCON's product. Although there is little to differentiate the products technically, NRG Management has introduced a support application that allows the user to manage their energy management systems remotely via a smart phone or tablet device. This application is becoming a key differentiator for customers when choosing between the products.

Mark LeBlanc is ICON's head of marketing. He realises that this application could spell disaster for UCON if they don't produce a similar offering, and quickly! Jane Coates is the head of development and keen to get an application up and running as soon as possible. In fact, every member of the senior management team is supportive of this course of action. Daniel Fogleburg (CEO) stops by Jane's office one afternoon before heading home. Jane is keen to get started on the app development, and is convinced her team can have a working model up and running for testing within 8 weeks. Daniel finds Jane's argument very compelling and knows all he has to do is give the word and the development will start. However, another thought occurs to Daniel at this time – we can either use this development opportunity to catch up with the competition, or pass them out. Which of these will depend on how we go about developing the new application. Daniel leaves Jane's office with the promise that he will think about it that night and come back to her in the morning with a decision…

Questions:

- Do you think Daniel is right to think over the issue before making a decision?
- How do you think they should start the development – where on the interaction life cycle model should they start, and why?
- What type of prototyping is Jane looking to engage with? Is it the right choice? What alternative is there?
- Time is important in getting their application to market. What benefits could possibly be had by engaging end users in the process?

9.3 Evaluating New Products or Services

Evaluation is a very important stage in the interaction life cycle process (see Figure 9.2). A properly conducted evaluation will check to see how the end user interacts with the new product or service. The evaluation will also look to assess how the users like and accept the product or service. In effect, evaluation is concerned with gaining feedback on how the design meets **usability** and **user experience** goals.

It is important to note that evaluation is not just concerned with the technical aspects of the design. A well-planned evaluation can also provide useful feedback from a business and marketing perspective. For example, early evaluation feedback can help marketing teams understand how new products or services are perceived not just on the merits of their technical functionality but also against competitor products, pricing and market trends.

Because of the diversity of products and services being developed there are no fixed criteria that should be applied in all cases. For example, developing a new interactive banking tool will be different to developing a new rapid application development platform for programming. The different user groups will be looking for different things in terms of utility and user experience.

9.3.1 When and How to Evaluate

When a product or service evaluation is conducted depends on the actual product or service. For example, is the product/service a brand new concept or an update of an existing product/service? If the product/service is being developed as a new concept, considerable time and effort will need to be expended in understanding the market and user requirements. Once the requirements have been captured and the market or environment in which the product/service is to be deployed, is understood then the next stage is to start to develop some low-fidelity prototypes (sketches, storyboards, basic models) to help validate any ideas and conceptual design thinking the developers may have. During the process of prototyping the design team should seek user feedback to help refine the underlying design thinking shaping the product or service. The prototypes will start to evolve into more complex and accurate representations of the final working product

or service. These higher-fidelity prototypes will also be evaluated through user interaction. As the high-fidelity prototypes start to become more functional the design starts to take on the structure and appearance of the final product or service. Through the process of interactive prototyping and evaluation with end users the design process reduces the risk of product/service failure.

If the design is simply an upgrade of an existing product or service then the focus will usually be on minor change as opposed to a total redesign. Therefore, the focus will be on improving certain aspects of functionality such as:

- User interface usability.
- Screen resolution.
- Connectivity.
- Robustness or durability.
- Localisation (language support).
- Component performance.
- Overall performance (bug fix).

Many products and services go through many design upgrades through the course of their lifetime. The speed and frequency with which these upgrades happen will depend on a number of issues, such as:

- The thoroughness of the initial requirements captured.
- The quality of development and production.
- Evaluation criteria for the prototyping stage.
- How representative the user test groups are of the target market.
- The speed of technological change.
- The speed at which competitors can launch new/upgraded products to market.

Being able to manage these issues is an important aspect of designing, developing, and launching properly functioning products and services. Therefore, knowing when and how to evaluate the design is critical to the successful launch of any product and service. Broadly speaking there are two types of evaluation. These are **summative evaluations** and **formative evaluations**. Summative evaluations are carried out to assess the successful completion and functionality of the design. Does the final product or service do what it was designed to do? And does it meet the user's requirements? Formative evaluations are carried out during the design phase, and are there

to help refine and test the design against the user's needs. Formative evaluations are carried out at all stages of the interaction design life cycle.

9.3.2 Evaluation Approaches and Methods

When conducting an evaluation, whether summative or formative, there are basically three approaches that can be used (Sharpe, *et al.,* 2009). These are as follows:

- **Usability testing:** The focus of this type of evaluation is usually on the user's performance in conducting certain pre-defined tasks with the product or service. Usability testing is usually conducted in a controlled setting such as a laboratory where the task and performance can be tracked in a quantifiable manner. A key aspect of this approach is that the evaluation is controlled and directed by the evaluator and not the end user.

- **Field studies:** The main difference between this approach and usability testing is that a field study evaluation takes place in the user's own environment. This could be their office, home, or wherever it is expected that they would use or interact with the product or service. The main focus here is to gain an understanding of how the user interacts with the product or service. Therefore, the user is controlling the evaluation study. The evaluator may put constraints around the test, such as time frames to complete the study, or certain conditions under which the product/service is not to be used (for health and safety) i.e. not near water or animals, after consuming alcohol, or if you experience light headedness. etc. However, the user is free to decide how they use the product or service.

- **Analytic evaluation:** With this type of evaluation two categories of evaluation are considered. These are **inspections** and **theoretical models**. Inspections are made up of either **heuristic evaluations** or **walkthroughs**. With heuristic evaluations prior knowledge of user behaviour and requirements is applied to the new design. Heuristics are based on common-sense knowledge and usability guidelines. However, care needs to be taken with following these guidelines as sometimes the guidance may not be as relevant as originally thought (Cockton *et al.,* 2002). Walkthroughs simulate the user's problem-solving approach to

navigating through, or using the product or service. The main focus of this type of evaluation is to try and assess how quickly and easily the user learns how to use the product or system. Theoretically-based models are designed to try and predict user performance. A key aspect of analytical evaluation is that the user need not be present during this evaluation approach.

The key aspects of each evaluation approach are identified in Table 9.8 below:

	Usability Testing	Field Studies	Analytical
Role of users	To carry out set tasks.	Natural behaviour.	User not involved.
Who controls	Evaluator controls.	User controls.	Evaluator controls.
Location	Laboratory.	Natural environment.	Laboratory.
When used	During prototyping.	Early design stage.	Any stage of the design process.
Type of Data	Quantitative.	Qualitative.	Mainly quantitative.

Table 9.8: Characteristics of Different Evaluation Approaches (Sharpe *et al.,* 2009)

As shown in Table 9.8, each of the evaluation approaches will produce some data for analysis. There are different methods for collecting these data which include but are not limited to the following:

- **Observation studies**: Qualitative and quantitative data gathering.
- **Questionnaires**: Qualitative and quantitative data gathering.
- **Interviews**: Mainly qualitative.

Table 9.9 shows how these methods can be used for different approaches.

Method	Approach	Focus of Method	Comment
Observation studies	Analytical, Field, Usability	Gaining insight into user performance, user interaction, design/technical performance.	For analytical evaluation observational data from previous evaluations may be used.
Questionnaires	Field, Usability	Understanding the user experience, design/technical performance.	May be used to collect both quantitative and qualitative data.
Interviews	Field, Usability	Understanding the user experience.	Mainly used to generate qualitative data.

Table 9.9: Comparison of Methods for Evaluation

Once again, the method used will be determined by what understanding or insight the particular evaluation is looking to gain. So, for example, interviews and questionnaires are not useful for analytical evaluation, if no end users are to be asked to participate. However, data acquired from previous questionnaires and interviews may be used to help define what needs to be evaluated as part of an analytical evaluation. This type of data would be very useful for either a heuristic or walkthrough evaluation.

9.3.3 A Framework for Evaluation

Irrespective of the evaluation approach to be taken, there is a basic framework that can be followed to ensure the evaluation delivers the right data. This is important because an evaluation can be expensive and time consuming. Therefore, if the wrong questions are asked of the wrong user groups the data produced may be irrelevant or misleading. This can either delay the development or focus it on the wrong set of requirements. Because of this any evaluation exercise needs to be planned out in a way that will ensure the right insights and understandings are gained.

According to Sharpe *et al.* (2009), there is an evaluation framework that will help to ensure the correct focus is applied during the course of any evaluation. The framework conforms to the following mnemonic:

DECIDE. This provides a checklist to follow when planning and implementing an evaluation.

- **D**etermine the goals: What is the purpose of the evaluation? What are you trying to understand?
- **E**xplore the questions: What questions need to be asked to help gain insight and understanding concerning performance, usability, ease of use, aesthetic appeal, etc.?
- **C**hoose the evaluation approach and method: Which evaluation approach and methods are best suited to gain the level of understanding required?
- **I**dentify the practical issues: What issues exist such as access to users, available funding, time limitations, access to expert opinion, etc.?
- **D**ecide how to deal with the ethical issues: What if any, are the ethical issues involved with the method of evaluation? Should the users be anonymous? Should they be segregated based on job type, etc.? Can we survey minors? What can we do with the data collected? Who should/will have access to the information collected?
- **E**valuate, analyse, interpret, and present the data: How do we effectively analyse the data using quantitative and qualitative methods? How should these data then be presented in a way that fairly and accurately presents the outcome of the evaluation exercise?

It is worth noting that an evaluation exercise will generate data that may or may not be well received by certain stakeholder groups within the organization. Individuals might become very attached to the idea of a new product or service and, therefore, may not be receptive to evaluation data that show the design in an unfavourable light. This is where managing expectation and conflict comes into play. Sometimes the evaluation can identify serious issues with the design of the product. This may necessitate a decision on whether the development goes ahead or is stopped and the funding redirected to other projects. Ensuring the evaluation is carried out correctly will help all stakeholders take a more objective view of the evaluation findings. Any concern over the way in which the evaluation was handled may result in another evaluation being called for, which in turn will introduce further delays and uncertainty into the development project.

Time Out

Think about it: Understanding the Results

LinkSym Co. manufactures ovens and stoves for domestic and commercial use. Their products are proving very popular as they offer a number of additional benefits to the end user; such as a heat transfer system that can be used to provide heating for domestic and commercial premises. The products also come with the option of burning oil, solid fuel, gas, or operating on electricity. However, the products are costly and can be expensive to install due to their weight and possible alignment to pre-existing heating systems.

Jan Hammer is responsible for marketing for LinkSym Co. and is aware of growth in the number of substitute products now being offered by competitors. Jan knows that they have developed a differentiation strategy, which has worked well to present their products as high-end, high-specification cooking systems. It would not suit the company to change to a low-cost strategy in order to directly compete with the competition. Considering the costs involved in producing their products, LinkSym could not possibly hope to under-cut the competition. Toby Asai (CEO) agrees with Jan. What they need to do is highlight why their product is different and the benefits it will bring for the end user. Toby wants a service offering to wrap around the physical product that will make the purchase of their products a “no-brainer” for the customer. The question is what does this service-offering look like?

Andy Yung, head of sales, thinks he has the perfect answer; let’s provide the customer with free removal and disposal of their existing oven or stove! Certainly, the rest of the management team think this sounds like a good offering. However, Amanda Coy isn’t convinced. Amanda is the head of product development and puts forward the counter proposal that they should go out to their customer base and try to build a set of requirements around what they might want, and then build a few prototypes of the service for evaluation.

Jan is concerned that this will take an unnecessary amount of time, during which they will continue to lose market share. Also, this isn’t a new oven or stove they’re designing, so they don’t need to go through the life cycle

process. After a hasty discussion Toby makes the executive discussion to go with Andy Yung's plan, and directs Andy and Jan to go away and cost up the new service offering…

Questions:

- Do you think the team, with the exception of Amanda, are right to think that evaluating the design of the service is not necessary, as they are not building a physical product?
- How do you think a service could improve the customer's usability or experience goals?
- Although the product is not changing, the service will be new. How do you think the design of the service should be evaluated?
- In terms of expediency, do you think the service needs to be modelled using low- or high-fidelity prototyping?

9.4 User Acceptance of Technology

No matter how good the technology or design, not all new products or services are immediately successful in their chosen markets. Adoption of new technologies may take time for a number of reasons:

- **Lack of obvious business benefits:** What additional benefit will the new product or service bring to our business? Will it actually make any difference to our competitive position within our market?
- **Lack of connectivity:** What systems can we connect to the new product or service? What additional technology, or changes to our existing technology do we need to make in order to integrate the new product/service into our information systems?
- **Lack of support:** Who will be able to support us if we adopt these products or services? Will we be tied to one provider with little option for change should we fail to get the service we pay for?
- **Lack of standardisation:** What standards exist to ensure the current technology will continue to be compatible with the next iteration of the product or service, or with other competitive products or services?

- **Lack of trust:** How new is the technology or the organization providing the product or service? Will they still be in business if we commit to using the new product or services?
- **Lack of training**: How can we use the new technology? Do we need additional skills to drive any benefit for investing in the new products or services?

A simple way of visualising this adoption cycle is through Gartner's Hype Cycle (Fenn *et al.,* 2009) as shown in Figure 9.3.

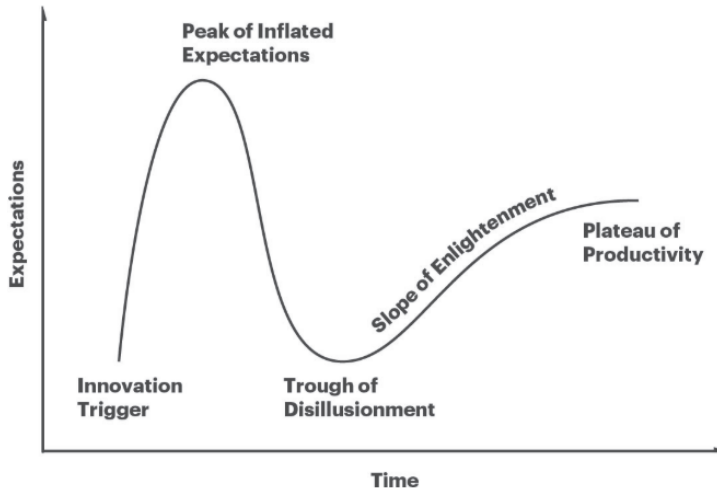

Figure 9.3: Gartner's Hype Cycle (Gartner Methodologies, "Gartner Hype Cycle," 2020 https://www.gartner.com/en/research/methodologies/gartner-hype-cycle2005)

The hype cycle is divided into five key stages. These stages start from the left-hand side of Figure 9.3 and move with time across to the right. The level of expectation on behalf of the user or adopter of the technology is measured on the vertical axis on the left-hand side of the graph. The five stages can be explained as follows:

No	Stage	Description
1	Innovation Trigger	A potential technology breakthrough kicks things off. Early proof-of-concept stories and media interest trigger significant publicity. Often no usable products exist and commercial viability is unproven.
2	Peak of Inflated Expectations	Early publicity produces a number of success stories – often accompanied by scores of failures. Some companies take action; many do not.
3	Trough of Disillusionment	Interest wanes as experiments and implementations fail to deliver. Producers of the technology shake out or fail. Investments continue only if the surviving providers improve their products to the satisfaction of early adopters.
4	Slope of Enlightenment	More instances of how the technology can benefit the enterprise start to crystallise and become more widely understood. Second- and third-generation products appear from technology providers. More enterprises fund pilots; conservative companies remain cautious.
5	Plateau of Productivity	Mainstream adoption starts to take off. Criteria for assessing provider viability are more clearly defined. The technology's broad market applicability and relevance are clearly paying off.

Table 9.10: Phases of the Hype Cycle (Gartner Methodologies, "Gartner Hype Cycle," 2020 https://www.gartner.com/en/research/methodologies/gartner-hype-cycle)

Figure 9.4 below is taken from Gartner's 2012 innovative technology review. Here Garter has identified how they see significant technology innovations being adopted between 2012 and 2020. Some technologies will progress faster along the cycle than others. The speed at which this happens will be influenced by the issues identified at the start of this section such as lack of support, connectivity, etc.

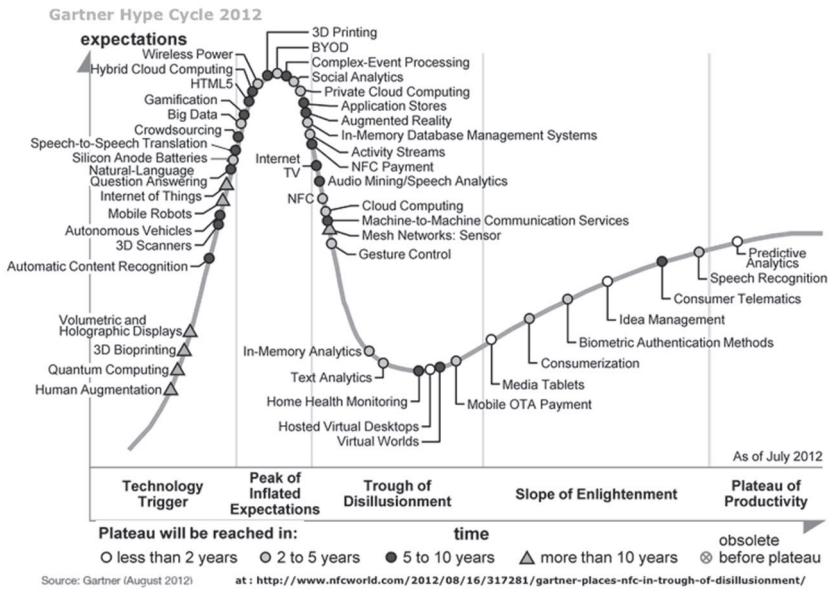

Figure 9.4: Example of the Gartner Hype Cycle

A perfect example of an innovative technology that has yet to drive a growth in adoption is the "Internet of Things" or "IoT". It is probably more accurate to refer to the IoT as a suite of connected technologies that take advantage of the internet to communicate, analyse, and share information. A commonly used example is the idea of a kitchen fridge that can tell you when your milk is running low. Certainly, the technology exists to deliver such a service; however, the benefits to the end user have still to be made in a way that drives demand for such a capability. That said, the IoT is beginning to see other technologies move further along the curve into the slope of enlightenment stage. These include smart watches, health-monitoring bracelets, and apps that allow you monitor and control your home energy usage.

Another way of looking at how technology integrates into or lives is Rogers' **Adoption Curve**. This curve highlights the general fact that not everyone looks to adopt new technologies at the same time. Some individuals are what Rogers refers to as early adopters, whilst others display a reluctance to adopt or move over to new technology. Figure 9.5 shows Rogers' adoption curve in more detail.

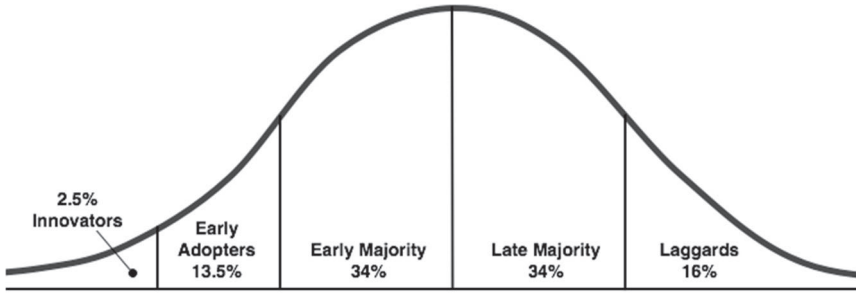

Figure 9.5: Roger's Adoption Curve (Rogers, 2010)

Rogers' adoption curve (Rogers, 2010) states that with every new product or innovation people will adopt it at different rates. For example, approximately 2.5% of the potential market will adopt the new product or service straight away. Many of these people will be technology specialists and product reviewers. A product that might fall into this category would be Google glasses; not widely available or supported, but they were reviewed and promoted by a small technical community. The next stage is the "early adopters" stage. This group and the early majority group are critical if the product or service is to gain acceptance. The success or failure of the product or service will be seriously impacted by the rate of adoption and satisfaction of these groups. In fact, many early adopters will take to social media, such as Twitter or YouTube, to demonstrate the virtues and failings of the respective product or service.

Rogers' adoption curve seems to introduce an element of uncertainty in that the success or failure of a product or service is left to a small minority of early adopters to decide on. Organizations can try to reduce this element of risk through the implementation of good interactive design practices as covered previously in this chapter.

However, both of these graphs provide a general view of how technology is adopted, and how individuals shift over to using new technology. They are not specific to any one product, or providing any deep insight into how a new technology, yet to be launched, will be received.

9.4.1 The Technology Acceptance Model

Davis (1989) developed the **Technology Adoption Model** (TAM) to help predict how users will react to new technologies. The model focuses on two aspects of the user experience. These are **perceived ease of use (E)** and **perceived usefulness (U)**. Perceived usefulness is the degree to which a person believes that the technology will be useful in helping them perform their required tasks. Ease of use is the degree to which a person believes the technology will be easy to use.

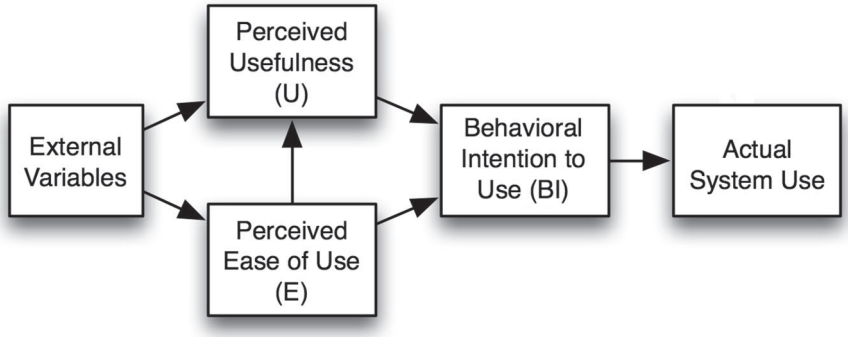

Figure 9.6: Technical Adoption Model (TAM) (Davis, 1989)

As the technology adoption model (TAM) in Figure 9.6 shows, the ease of use (E) and perceived usefulness (U) are also influenced by external factors. These factors may include:

- **Accessibility to technology:** How easy is it to get access to the technology?
- **System's features:** What will the technology allow you to do?
- **Level of user support:** What support is there for users should they have a problem?
- **Required level of technical awareness:** What technical skills do the users need to use the technology?
- **Suitability of technology to the environment:** Is the technology ready to operate in the deployed environment? (Office, building site, battlefield, surgical operating theatre, marine environment, etc.)

The TAM shows how external factors can influence the user's perception of usefulness and ease of use. These, in turn, will further influence the behaviour exhibited by the user in their interaction with the technology (BI), which in turn will determine how the technology is used and adopted.

It is worth noting that in Davis' research the relationship between perceived usefulness (U) and intention to use (BI) was stronger than the relationship between perceived ease of use (E) and intention to use (BI). This makes sense, as it is easier to see how users will use a system that is useful as opposed to being simply easy to use. By using an interaction design model, end-user engagement can help to ensure that external factors impacting usefulness and ease of use can be better understood.

9.4.2 Understanding the Purpose of Technology

Understanding the requirements from an end-user perspective is critical if users are to accept, adopt, and use technology in the desired manner. The role of the end user is just as important for the development of internal systems as it is for external systems. Ensuring the user is an integral part of the design process will help to reduce the potential impact of any accidental omissions of any of the key requirements.

For organizations that value knowledge creation and sharing as part of their culture, alignment between business and technology must consider interaction design as a fundamental approach to designing information systems. Nonaka *et al.*'s (1995) organizational learning model was discussed in Chapter 7 (Using Technology to Support Knowledge and Innovation).

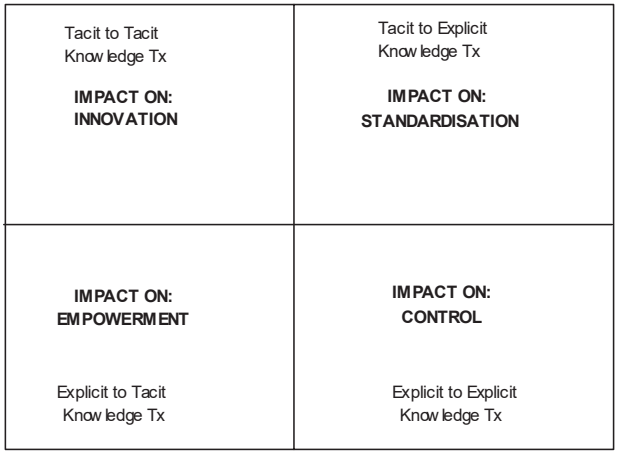

Figure 9.7: Organizational Learning Model (Nonaka *et al.*, 1995)

What we can see from this model is that the type and focus of the knowledge activities in each learning quadrant will differ. The focus will shift from innovation around to empowerment. The point to remember here is that when developing new systems for an organization it is important to understand how the users interacting with the systems will view them in terms of ease of use (E) and perceived usefulness (U). Whilst Davis (1986) identified the fact that users value usefulness over ease of use, if the technology is not well designed, and is difficult to use, to a point where the user becomes frustrated, annoyed, or distracted, then they may look for alternative systems to help them get their work done.

As all technology should strive to meet the user's usability and experience goals, the purpose of the technology could be due to very different reasons. Once again as per Nonaka *et al.*'s (1995) organizational learning model the technology could be designed to support one of the following:

Primary Knowledge-based Activity	Description	Supporting Technology Examples
Support Innovation	How can the technology help connect users and support the open transfer of ideas?	Instant messaging, email, YouTube, LinkedIn, Twitter, Message boards, Wikis etc.
Support Standardisation	How can technology ensure unstructured information is collected in a way that will allow it to be effectively processed and analysed in a standardised manner?	Online survey tools, Insurance, Flight booking, Tax revenue websites. SAP order management front-end systems.
Support Control	How can technology improve the processing of information in a way that reduces input error for critical processes?	JIT, ERP systems. RFID tracking systems. Air traffic control systems.
Support Empowerment	How can technology present information and data in a way that will enable better decision-making?	SAS analytics, Qualtrics data analysis, Tableau, Data visualisation software.

Table 9.11: Primary Knowledge-based Activities

These knowledge-based activities are not mutually exclusive as some systems can support more than one type of activity. For example, an online tax return system will focus on standardisation and control as the two-dominant knowledge-based activities, and air-traffic control systems will focus on both control and empowerment. Therefore, as part of the design of any internal information systems, or the assessment of any new technology, organizations must have a clear understanding as to which knowledge creation and transfer behaviour the system is trying to influence amongst the end users.

This raises the notion of a potential tension that exists between designing a product or service that meets the end user's perceived usefulness and ease of use, and the need to manage the knowledge-based activity the product or

service is designed to support. This in turn highlights the need to be able to manage conflict and expectation.

Time Out

Think about it: Who exactly is this system for?

Rogers College of Higher Learning has a very proactive and progressive distance-learning programme. The college's Business School has two undergraduate and three postgraduate courses that have been running at full occupancy for the last five years. The completion rate is well above average for distance learning with 67% of undergraduates completing their courses and graduating within five years, and 87% of postgraduates completing within two years.

Prof Markus Jones (Head of the Business School) is very proud of the success of the distance-learning programme (DLP), which has benefited from significant investment in technology over the last three years. However, other colleges and universities are beginning to wake up to the opportunity for growth in student numbers and revenue that a well-structured DLP can deliver. Over the last 18 months the Business School has seen the number of competitors, offering similar courses, in this space go from two to seven, and more are on the way. The Business School needs to think about how it can protect and grow its position in the DLP market.

Dan Wei is the Head of Information Services, and has been talking to Anya Kuskrenko (Head of Alumni Services) about an idea she has had for a peer-to-peer network for the students. Anya wants to use technology to provide undergraduate and postgraduate students with an online space to come together and discuss issues, and build a support network. Dan certainly thinks this is a good idea and suggests that maybe they should get some of their existing distance-learning students to form a focus group to help identify what the online space should deliver. Prof Kath Holmes is the Head of Learning, and whilst Kath is for the improvement of student support services, she is also aware that technology can be expensive; especially if the technology is being used to develop a new bespoke application.

Because of this Kath wants to ensure some more thought goes into the development of this, or any new information systems.

Questions:

- Do you think Prof Holmes is correct in holding back the development of the peer-to-peer system for students?
- How could the TAM help Dan and Anya assess the likelihood of the peer-to-peer network being a success?
- In terms of Nonaka's organizational learning model what type of knowledge-based activity should the system primarily focus on? Are there any other knowledge-based activities the developers should be aware of?
- Is it necessary to conduct a high-fidelity prototype, or will a low-fidelity prototype suffice?

9.5 Learning Summary

The "user" experience becomes important as organizations use technology to interact with their customers. However, the development of many bespoke systems is expensive, and there is a risk that if the systems do not meet user requirements then they may take their business elsewhere. As competition is intense, organizations cannot afford to get the interaction point between the user or customer and the organization wrong. Understanding how individuals connect to an organization's systems is not just important for external users, or customers, but also for internal users, or employees. If users of a system are not able or willing to use a system, they may start to look for alternative options. This may in turn lead them to a competitor's offering, or the use of their own technology to complete the necessary task.

Because of this many organizations have realised the importance of placing the user, or customer, at the centre of their design activities. This is at the heart of the **Service-dominant Logic** approach to how organizations now look to develop their portfolio of offerings. The main driving question is no longer "*what can we sell to the market?*" but "*what does the market need?*"

By thinking like this many organizations have managed to successfully transition from a product-focused to a service-focused business. These organizations are using information and knowledge to better understand and react to changing user/customer requirements. Technology can then be used to support the development of competitive knowledge intensive services.

The service-dominant logic approach is underpinned by three core concepts:

- Co-creation of value.
- Relationship building and management.
- Service provision.

Once again, technology can play a significant part in helping organizations to realise these concepts in pragmatic and practical ways. It is also important to remember that the quality of service provision needs to be evaluated from the user or customer perspective.

Organizations are now faced with the challenge of understanding how to keep developing innovative services that will continue to differentiate them from their competitors. Thankfully, technology can help as advances in internet enabled technologies have also enhanced technology's ability to support improved productivity gains. It is vital to understand the customer's needs in terms of how they want to interact, use, or consume the products or services, and even how they see these products and services supporting their own business requirements. Therefore, an important place to start is developing a clear understanding of the end user or customer's requirements, and then creating innovative services and products to meet those requirements.

A key aspect of designing any interactive system is to understand the main use that the system is to carry out. It is also important to understand how the user, or customer will interact with the system. Therefore, it is important, when considering the objectives of any system development, to consider design factors such as **Usability** and **User Experience Goals**. In order to gain insight into these factors it is important to include the user/customer in the design process. However, when seeking input from multiple stakeholder groups it is quite common to need to manage **Conflict** and **Expectation** as part of the design process.

There are many different types of design models that vary in how they are applied but still focus on the three basic fundamental design activities:

Understanding Requirements, Developing a Design, and then **Evaluating the Design**. Having collected the user requirements, it is often a good idea to develop a model or **Prototype** for testing and evaluation before committing completely to the design. There are many different ways to develop a prototype, but they all fall into one of two broad categories: **Low-fidelity** and **High-fidelity** prototyping. For just about all development processes it is advisable to start with low-fidelity prototyping.

Evaluating the design is an iterative process, which involves going back and forth between the users and developers until a final design is agreed upon. There are two types of evaluation. These are **Summative Evaluations** and **Formative Evaluations**. To help developers focus on the right aspects of the evaluation process there is a framework whose stages are identified through the **DECIDE** mnemonic.

No matter how good the technology or design, not all new products or services are immediately successful in their chosen markets. The adoption of new technologies may take time. A simple way of visualising how technology gains general acceptance is through **Gartner's Hype Cycle**, and then how users tend to adopt technology in stages is visualised through **Rogers' Adoption Curve**. However, both of these graphs provide a general view of how technology is adopted, and how individuals shift over to using new technology. They are not specific to any one product, or providing any deep insight into how a new technology, yet to be launched, will be received. This is where the **Technology Adoption Model (TAM)** can help to provide more insight. The model focuses on two aspects of the user experience. These are **perceived ease of use (E)** and **perceived usefulness (U)**. It is worth noting that the relationship between perceived usefulness (U) and intention to use is stronger than the relationship between perceived ease of use (E) and intention to use. This makes sense, as it is easier to see how users will use a system that is useful as opposed to one that is simply easy to use. By using an interaction design model end-user engagement can help to ensure the external factors impacting usefulness and ease of use can be better understood.

For organizations that value knowledge creation and sharing as part of their culture, a correct alignment between business and technology must consider interaction design as a fundamental approach to designing information systems. Whilst all technology should strive to meet the user's usability and experience goals, the purpose of the technology could well be for very different reasons. Therefore, as part of the design of any internal

information systems, or the assessment of any new technology, organizations must have a clear understanding as to which knowledge creation and transfer behaviour the system is trying to influence amongst the end users.

This raises the notion of a potential tension that exists between designing a product or service that meets the end user's perceived usefulness and ease of use, and the need to manage the knowledge-based activity the product or service is designed to support. This in turn highlights the need to be able to manage conflict and expectation.

9.6 Case Study: Software as a Service: MS Windows 8

Even as far back as the mid-1990s there was a growing realisation that the development and distribution of software would need to radically change. The increase in the number of software packages, the need for version control, and the licensing issues were beginning to drive a lot of resources in terms of managing the increasing complexity. Organizations found themselves hiring technical specialists to ensure their portfolio of software applications continued to work and support critical business processes, as hardware continued to change. Licensing and compatibility were also becoming issues as technology started to become more connected, and the workforce more mobile. Organizations found themselves paying for a level of support that was not engaged in any revenue generating activities, but was focused on avoiding litigation, and ensuring the core business processes continued to work.

The development of software up to this point had been really driven from a developer's perspective, and what they believed the market required, as opposed to an end-user's perspective. In effect, the software industry was predominantly following a goods-dominant logic approach to product development and support. Then as the 21st century approached, the notion of software as a service started to manifest. Many customers and end users were becoming concerned over the mounting costs involved in software management, and the industry began to see potential opportunities, in what was becoming a very competitive market. Many applications were becoming necessary to getting work done, but not directly responsible for driving competitive positioning. Operating

systems, office suites, graphics packages, financial management applications, and web development applications were becoming widely available and interchangeable. In a growing market of similar products software providers needed to find new ways of differentiating their offering in a way that would attract and retain customers.

The drive to take or reduce the administrative cost of managing software for the end user was becoming a key deciding factor in selecting new software. Providers who could help customers do this would be better positioned to make the sale. Providers also saw this as a shift from providing software in a box, to providing processing capability on demand. Advances in internet technologies such as cloud computing, high-speed broadband, and virtualisation meant that software could now be delivered and accessed by the end user without the need for physical shipment and delivery. End users can now access just about any bespoke application instantly (or within a few hours depending on download speeds).

In 2012 Microsoft launched what it believed would be an operating system more in tune with the needs of the internet-savvy user. This was to be a key product launch to support the then CEO, Steve Ballmer's vision that windows "would be everywhere and on every type of devise, without compromise". The operating system contained user interface improvements such as touch screen technology and improved integration of internet applications across the suite of Microsoft products.

However, the product met with mixed reviews. Although Windows 8 was technically superior to Windows 7, many users found the interface to be confusing, with some critics calling the interface "clumsy and impractical". ZDNet, a well-respected online magazine, went as far as to comment that "Windows 8 wasn't born out of a need or demand; it was born out of a desire on Microsoft's part to exert its will on the PC industry and decide to shape it in a direction focused on touch technologies and tablets". Windows 8 was also impacted by fears from non-US governments and corporations that the level of internet integrated applications would leave computers susceptible to cyber-attacks. Because of these issues many individual and corporate users resisted upgrading from Windows 7. So, less than three years after the release of Windows 8, Microsoft released Windows 10. This operating system, which Microsoft describes as an operating system as a service, has received mainly positive feedback.

Questions:

1. When we consider the user acceptance aspect of technology adoption it may take time for a new technology to gain popularity for a number of reasons. In the case of Windows 8 what do you think these reasons were?
2. Consider the technology adoption model (TAM). What aspects of the model do you think could have helped to identify the potential barriers to the uptake of Windows 8?
3. What aspects of "usability" and "user acceptance goals" could have been considered in order to improve the adoption of Windows 8?
4. What type of evaluation techniques could be used to try and reduce any perception gaps growing between what the end users actually want, and what the developers think the end users want?

9.7 Review Questions

True/False Questions

9.1 Technology will always improve the customer experience. T or F?

9.2 To build good customer interface systems all you need are highly skilled technical people. T or F?

9.3 Technology-based solutions, to be successful, need to be aware of how customers want to interact. T or F?

9.4 To remain competitive organizations must place the customer at the centre of what they do. T or F?

9.5 Technology can help in connecting and supporting the customer's service requirement. T or F?

9.6 Within a post-industrial society the key economic drivers are information and quality of life. T or F?

9.7 Service-dominant logic only concerns itself with the development, delivery and consumption of services. T or F?

9.8 Co-creation of value depends on the customer having some input in the development of the service. T or F?

9.9 It is vital to understand customers' needs in terms of how they want to interact, use, or consume the products or services, and even how they see those products and services supporting their own business requirements. T or F?

9.10 According to Sharpe *et al.* (2009) when designing a system, it is necessary to mainly consider system usability. T or F?

9.11 It is acceptable to develop a system that considers the needs of the customer above the cost of the system to the organization. T or F?

9.12 Having collected the user requirements it is often a good idea to develop a model or prototype for testing and evaluation before committing completely to the design. T or F?

9.13 A properly conducted evaluation will check to see how the end user interacts with the new product or service. T or F?

9.14 The purpose of an evaluation is to confirm that the original design was the correct one. T or F?

9.15 If a product or service is designed well it will be an instant success. T or F?

9.16 Rogers' adoption curve (Rogers, 2010) states that with every new product or innovation people will adopt it at a consistent rate. T or F?

9.17 According to Sharpe *et al.* (2009) there is an evaluation framework that will help to ensure the correct focus is applied during the course of any evaluation. The framework is known as DECIDE. T or F?

9.18 Gartner's hype cycle is divided into six stages to chart the adoption cycle for new technologies. T or F?

9.19 Wizard of Oz is a form of low-fidelity prototyping. T or F?

9.20 If possible, you should always start with high-fidelity prototyping. T or F?

Multiple Choice Questions

9.21 Vargo & Lusch (2004) summarise the debate of goods versus services as a primary economic exchange by dividing the debate into broad periods of marketing thinking. Which of the following is not one of these periods?

A. Classical and neoclassical
B. Decision marketing schools
C. Marketing management and expert
D. Goods-dominant logic

9.22 According to Fitzsimmons & Fitzsimmons (2003) we now live in which era?

A. Post-industrial
B. Post-colonial
C. Post-empirical
D. Post-national

9.23 Vargo et al. (2004) state that service-dominant logic is underpinned by three core concepts. Which of the following is not one of the core concepts?

A. Relationships
B. Finance
C. Service provisioning
D. Co-creation of value

9.24 Design approaches share three fundamental activities. Which of the following is not usually considered one of these shared activities?

A. Understanding the requirements
B. Developing a design that satisfies requirements
C. Evaluating the design
D. A hi-fidelity prototype

9.25 Which of the following stages is not from the interactive life cycle model as proposed by Sharpe et al. (2009)?

A. Design
B. Identify requirements
C. Evaluate
D. Decommission

9.26 The adoption of new technology may take time for a number of reasons. Which of the following is not considered a reason for failure to adopt?

A. Lack of symmetry
B. Lack of connectivity
C. Lack of trust
D. Lack of support

9.27 Which of the following is not an advantage of low-fidelity prototyping?

A. Lower development costs
B. Useful communications device
C. Useful for testing functionality
D. Addresses user interface issues

9.28 When defining user experience goals (UEG), which of the following is not classified as a UEG?
A. How satisfying it is to use
B. How safe it is to use
C. How much fun it is to use
D. How reliable it is to use

9.29 The TAM, as described by Davis (1989), has five components. Which of the following is not one of the components?
A. External variables
B. Perceived uniqueness
C. Perceived ease of use
D. Actual system use

9.8 Review Question Answers

True/False Answers

9.1 F, 9.2 T, 9.3 T, 9.4 T, 9.5 T, 9.6 T, 9.7 F, 9.8 T, 9.9 T
9.10 F, 9.11 F, 9.12 T, 9.13 T, 9.14 F, 9.15 F, 9.16 F
9.17 T, 9.18 F,9.19 T, 9.20 F

Multiple Choice Answers

9.21 D, 9.22 A, 9.23 B, 9.24 D, 9.25 D, 9.26 A, 9.27 C
9.28 B, 9.29.

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Chapter 10: Using Technology to Improve Business Processes

Learning Objectives

On successful completion of the chapter a student will be able to:

- Explain how technology can support the development of innovative processes.
- Define what is meant by "core business processes" and how they are identified.
- Describe how processes come together to make up a value chain.
- Define what can and cannot be realistically expected from technology in terms of process improvement.
- Explain how a core process can be seen as a knowledge or information pathway.
- Describe the main components of a process development framework.

10.1 Introduction

A main area of impact for technology across organizations is in improving process efficiency and flexibility. Without doubt this is one of the main advantages that technology brings to organizations looking to improve their competitive positioning or sustainability. With improvements in the compatibility, connectivity, and accessibility of technology the span of influence and control that technology is now able to bring to bear on business processes has increased significantly through the early part of the 21st century. Many organizations such as Intel, IBM, and Cisco are funding significant levels of research into new technologies and technology environments, such as Smart Cities and the "Internet of Things" (IoT). The focus being to understand how organizations and individuals will interact with these technologies. Putting aside the ethical and security issues that might go with such technologies (refer to Chapter 11 for more on securing your information), this new level of digital connectivity will significantly increase the number of sensors connected to existing core business

processes. Manufacturing companies and service providers, as well as governments and other third-party service providers, will be able to get user information in near real time from items such as cars, fridges, home heating systems, alarm systems, personal health monitoring systems, customer feedback booths, phones, etc.

In effect, technology is no longer just a simple way of automating basic manual processes such as data entry, stock monitoring, or invoice printing. These activities are still very important for many organizations and businesses, but the real value is in how technology enabled processes can help move information and data around the organization in a way that supports more effective decision-making. Because of this technology must be seen as more than just a simple cost to the organization, or a necessary evil to be borne by the organization. Therefore, decision-makers within the organization must understand the implications that technology can have for the operation of their core business processes. How technology will affect an organization's ability to connect with customers, analyse the market, or schedule orders into the manufacturing process cannot be left to the IT function alone to resolve. As discussed in Chapter 8 (Information Systems – Shaping the Organization), the implementation of technology has an impact on how we interact with organizations, both as customers and employees. Therefore, the implications of such a change need to be understood.

Understanding how technologies can both positively and negatively influence process performance is vital for any organization or business. An important starting position is to realise that technology in itself is not a positive or negative force for change, and therefore, the simple application of technology will not guarantee a successful outcome. What is important is that the appropriate technology is applied to fundamentally sound processes. From this position we can expect to see an improvement in process output.

This chapter will look at how technology can be used to improve process performance, and some of the key issues that managers and other key decision-makers must consider before embarking on a process improvement implementation programme.

10.1.1 Differentiating between a Process and a Capability

What do we mean by the word "process"? For Lewis *et al.* (2007) a process, or more specifically a business process, is "***a collection of interrelated tasks, which are performed to achieve a business outcome***". In fact, there are many different, but closely related definitions of a "process". However, what is common to them all is the **repetitive** and **deterministic** nature of the activity they are designed to manage. All organizations need the ability to manage their basic business and operational tasks in this way. However, when the organization or business finds itself in a dynamic and changing competitive environment, the need to be able to change and adapt quickly becomes a key ability. This is where the difference between a process and a capability becomes more apparent. With a capability, the focus is not just on ensuring that the deterministic output is maintained, but that the organization or business can respond appropriately to the changing nature of the competitive environment.

In Chapter 5, the argument was made for building capabilities to help sustain competitive advantage. As part of that chapter a distinction was made between a "process" and a "capability" centric organization. A more detailed description as to how they differ is as follows:

- **Process-centric organizations** are focused on developing an ability to produce a desired, repeatable output to a predetermined quality and quantity.

- **Capability-centric organizations** are not only concerned with developing and managing effective processes, but also in understanding what organizational abilities need to be developed to ensure core processes remain responsive, effective, and aligned to the strategic needs of the organization.

It is worthwhile just reconsidering the difference, as the ability to continually develop and refine processes in a way that continues to support the operational and strategic needs of the organization can be considered a "process management capability". What is important, even in a capability-centric organization, is the ability to develop and implement effective processes. Therefore, in effect, an organization cannot improve in terms of its capability maturity, unless it has sound and effective processes on which it can build.

10.1.2 Why the Need for Innovating Business Processes?

Developing processes that continue to support critical business or organizational strategic objectives is a core business activity. This is not simply a support function, but an activity that every organization or business needs to be competent at delivering. As business models change and adapt to the changing competitive environment the supporting processes must also change and adapt. Here technology can provide significant assistance in the following ways:

- **Time to develop:** Technology can speed up the development and test cycle for process development. This can be achieved through the use of team-rooms and collaborative software to bring virtual teams together to help build and test new processes.
- **Time to implement:** Deploying a new process can take time, especially if it is across a large, dispersed workforce. Technology can, through the use of workflow tools and task automation, reduce the number of people who need to be involved in the deployment and activation of the process.
- **Cost of implementation:** By automating key stages of the process, many of the manually intensive aspects of the process can be removed. This can have a significant and positive impact on the cost of running the process.
- **Improved quality of output:** By automating key stages of the process, technology can help to eliminate human error especially around data entry.
- **Process monitoring and control:** Technology can also be used to monitor process performance in a consistent manner, without lapses in concentration associated with human monitoring. Technology can also be used to provide regular reporting on process performance, which in turn can be used to trigger other processes.

In effect, technology can help to improve the overall quality and scale of a process' performance. However, there is a caveat, which is that technology will not make a bad process better, but it can significantly improve the performance of a well-aligned process. It is this point that needs some further attention. Unless a process is aligned to the operational and strategic needs of the organization it may perform well in terms of the quality and scalability of its output, but what is being produced may have little relevance to the changing needs of the organization or business. Take for example, an online retail site that accepts orders in dollars, sterling, and yen. The system

works out the price in real time based on the exchange rates being posted by the FTSE. The system works well; however, it cannot process orders placed in Euros, Australian Dollars, or Swedish Kroners. At one level the process works very well, but its inability to handle orders from other countries is limiting the business' ability to compete globally, and is potentially providing an opportunity for a competitor to gain some new customers.

Therefore, processes need to be able to flex and respond to changes in the competitive environment. To remain competitive organizations must continually look for new and innovative ways of doing things. This recognition that processes must become more responsive and better at implementing and supporting new business models has a significant implication for most organizations. What makes this difficult for many organizations is that most resources are aligned around business functions, such as marketing, manufacturing, finance, etc., and not around core business processes. Whilst many processes weave their way across an organization it is not an uncommon experience to find part of the organization waiting for another department or function to finish what they are doing with their part of a process before the next stage can commence. For organizations and businesses to truly become more aligned to their customers' needs and expectations their core processes must also become aligned in the same manner. This will require processes to become less dependent on functional alignment and more focused on the customer experience. This is a challenge that organizations and businesses are addressing through the development and management of their supply or value chains. Technology can provide a significant advantage in this area. However, before taking a look at the value chain, and how technology can provide added value, it is important to understand how technology can support process innovation.

10.1.3 Process Innovation

When we talk about process innovation, we are referring to the manner in which an organization can implement new ways of delivering process performance. According to Francis & Bessant (2005) "…***process innovation looks at the way products and services are delivered to the end user or customer***". This is an area where technology can add significant value if applied appropriately. As already discussed in previous chapters,

the implementation of technology needs to be aligned to the overall strategic and operational needs of the organization. To this end it is advisable that core business processes should not be designed or modified in isolation. The potential impact of any changes must be assessed across the organization. In order to develop effective processes Boddy *et al.* (2009) suggest a four-stage approach (Figure 10.1)

Figure 10.1 Stages of Process Innovation (Boddy *et al.,* 2009)

The application of each stage can be explained as follows:

- **Stage 1 – Develop an Organizational Process View:** This requires the development of a high-level organizational view, or map, of all the core processes, how they interact with each other, who is responsible for their operation, monitoring, and upkeep. This provides the organization with an understanding of the implications that any changes will make, not just on the processes in question, but on all the other dependent processes linked to those requiring change.
- **Stage 2 – Select Map and Processes:** Once the organizational map has been developed the processes requiring design or modification can be identified. Once identified, the processes should then be mapped in terms of how they currently operate. This will provide a sound basis on which to commence the design or redesign of the processes.
- **Stage 3 – Align IT/IS to Processes:** This stage looks at ensuring that the IT/IS requirements and the business process design are aligned.
- **Stage 4 – Implement Changes to Processes:** The final stage is concerned with the implementation of the changes required to set up and implement the new process.

As indicated in Figure 10.1, once stage 4 has been completed, the development cycle goes back to stage 1. Having a good view of how the core or critical processes are designed and inter-linked across the organization provides the organization with a very good foundation for identifying and selecting which processes need the most attention. By developing this level of process-awareness the organization can better ensure that limited resources are being used appropriately to develop and improve the right core business processes. In effect, having an overarching view of the core processes facilitates better decision-making in the following areas:

- **Process alignment:** Which processes are/are not aligned to the strategic objectives of the organization. As the strategy changes it is important to ensure that the core business processes can continue to deliver in accordance with any new changes in direction that the organization or business is taking.
- **Process criticality:** The number of processes can grow significantly over time, so it is vitally important that the core, or business critical processes are easily identified, as it is these processes that should have priority in terms of resource alignment and allocation. As the strategy changes over time the importance of certain processes will change. Therefore, it is important that key resources necessary for effective performance are allocated accordingly.
- **Process adaptability:** By developing a clear picture of how processes operate it can become easier to see how technology can be applied to help improve overall process performance. Understanding how processes depend on each other can help to provide more clarity concerning any decision to automate certain stages or aspects of critical business processes.
- **Process prioritisation:** All organizations will have a finite level of resources available to support their core business processes. These resources may be people, technology, finance, or even just time. Therefore, the allocation of resources must focus on processes that have been identified as delivering the most business value for the organization. The development of a high-level organizational map of the core business processes will help to identify where to best allocate resources based on a prioritisation of the critical processes.

Rothwell (1992) observed that for process innovation to flourish, the most important factor differentiating successful from unsuccessful innovation has been the degree of collaboration in the development and implementation of the core business processes. As competitive advantage can be gained through better collaboration between the different components of the organization, innovation must be managed as part of an organization-wide initiative.

There is, however, a significant challenge to organizations looking to develop a process map of their organization, and this is ensuring the ongoing relevance of the map. Over time individuals, departments and workgroups will tend to fine-tune or tweak those aspects of business processes that they are working with. Unfortunately, these changes can often go unrecorded, and as such the organizational map may become out-dated and non-representative of the actual processes across the organization. To that end, it is important that there is a management process in place to ensure changes are recorded and properly tracked at an organizational level. The next section will discuss this issue and outline a framework for managing ongoing process development.

Time Out

Think about it: To Automate or not to Automate?

CompTech Ltd. is a computer manufacturing company with major manufacturing sites located in Europe, Asia, and Central America. It provides manufacturing services to the top three computer providers in the world. CompTech Ltd. provides manufacturing capacity to these computer providers to help them manage increases in demand for their respective products without having to increase their own manufacturing capacity.

The company (CompTech Ltd.) has been in business for 25 years and has grown steadily for the past 15 years to become a company now employing over 120,000 employees worldwide. Dan Silvers (CEO) has personally overseen the development and launch of a manufacturing campus in South East Asia to accommodate the expected surge in demand for computers and computer peripherals over the next 10 years.

However, the VPs of both Manufacturing Operations and Re-engineering are retiring and their replacements have been hired. Both replacements have come from outside the organization and a major selling point at both interviews was their desire to cut costs and automate as many processes as possible. This approach was received very well by the board, with any initiatives focused on reducing costs, especially after the significant cost of setting up the new manufacturing campus still hanging over the organization.

At the last Senior Management Meeting, Sarah Lee (the new VP of Manufacturing Ops) stated that she was going to look at ways of reducing overhead costs by automating the manufacturing processes. Jason Flynt (new VP of Re-engineering) is in agreement, and has already started to look at some of the manufacturing lines and how they can be automated.

Dan Silvers isn't quite convinced this is such a good move. He knows that because they need to be able to respond to changes in their customers' demand profiles, they need to be able to change manufacturing lines quickly to go from building computers for one customer to another. Dan remembers trying this before, and the automated manufacturing lines were not flexible or quick enough to support the need to change, and because of this the change-over times introduced significant down-time between the different production runs. As neither Sarah nor Jason comes from a manufacturing background Dan is not sure if they are aware of this…

Questions:

- Do you think Dan is right to be concerned about the potential delays automated manufacturing will incur?
- Do you think the manufacturing process is a critical business process?
- How do you think they could reduce the risk of fully automating the manufacturing lines?
- Do you think Sarah and Jason are considering the impact that the change will have on the overall performance of the organization, or are they simply looking at the impact of automation on manufacturing costs?

10.2 Building Responsive Processes

In today's complex organizations the need to develop and control business critical processes is vital to the overall success of the business (Teece, 1998). However, the traditional functional approach, through a "siloed view" of process development is failing to deliver responsive, efficient, and effective processes that are needed to support inter- and intra-organizational business collaboration (van Weele, 2002; Argote *et al.,* 2000). The problem is further compounded by the rate of change now being experienced by organizations, where processes are constantly under pressure to support changing business directions and objectives. Therefore, an important question concerns how organizations, which are dependent on responsive complex business processes, can ensure that the processes remain responsive in such a dynamic environment (Lee *et al.,* 1997; Troyer, 1995). Many organizations are successful in changing their processes, but what mechanisms do they employ to ensure these processes, once deployed, do not "drift" away from their core function? This is a problem that is inherent in many functionally aligned organizations. This view is supported by Maull *et al.* (1995) and Smart *et al.* (1999) who identify the need for a commonly accepted and used reference model in order to "manage, operate and support" enterprise-wide business processes. A common approach to process development for most organizations follows the framework in Figure 10.1 below.

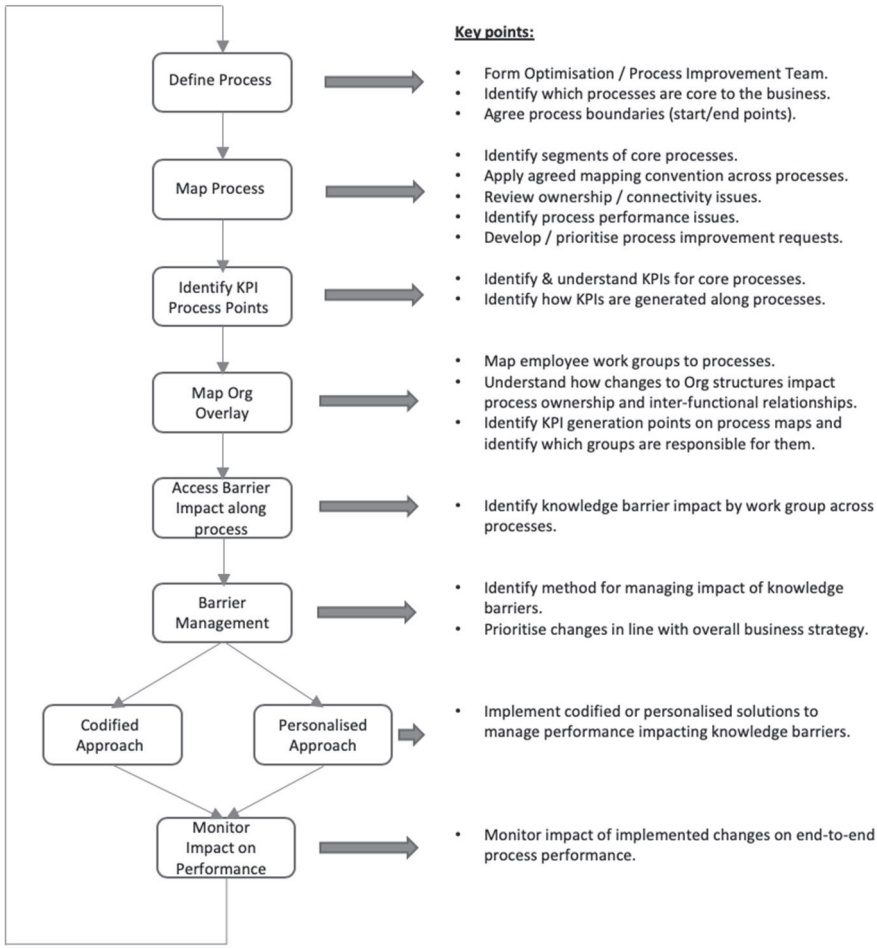

Figure 10.1: Generic Framework for Developing Knowledge-dependent Processes

Without doubt, the successful development of responsive and innovative processes is dependent on how the culture of the organization supports collaborative working. Developing a culture where collaboration is encouraged and supported across the organization will help to ensure that

processes remain relevant. Some actions that can help to support a culture of collaboration around process development are as follows:

- **Motivating employees:** For employees to identify improvements within their work environment they must be motivated to do so. This may mean modifying reward and recognition programmes as well as focusing on increasing levels of empowerment and responsibility amongst the workforce.
- **Capturing innovative ideas:** Organizations need to capture and process innovative ideas in a way that allows new ideas to be quickly assessed and implemented.
- **Modifying work practices:** Do existing work practices support the stimulation of new ideas? The organization should, if possible, consider how work practices may be modified to support innovation.
- **Stimulating cross-boundary innovation:** Developing innovative ideas within the boundaries of a business unit may have benefit for the organization as a whole; however, these are usually developed with the performance of the business unit in mind.

Once a process has been accurately defined in terms of how it contributes to the overall performance of the organization the flow of information and data along the process can be defined in terms of the technology needed to support it. For information-dependent organizations it is a logical progression to view core or critical business processes as information or knowledge pathways. As the information and data that flow through these processes are needed to drive critical business decisions the technology needed to support the flow must consider not only how the information and data are captured and stored, but also how they are accessed, visualised, and acted upon.

10.2.1 Processes as Knowledge Pathways

The rate at which organizations have to manage change is increasing, and a significant reason for this rate of change is down to the increased use and integration of technology to support and manage business processes. Coupled to this fact, organizations are also becoming aware of the increasing need to focus on customer's needs and desires in the development and provision of their products and services (Moller *et al.,*

2008). Organizations that fail to consider the needs of the customer during their process development will almost certainly experience the loss of business to the competition (Kulp *et al.,* 2003). This increasing rate of change and need to understand, and even predict customer behaviour means an organization's processes for product/service development and delivery need to be increasingly flexible and responsive. Unfortunately, many organizations now operate unnecessarily complex processes. This may be caused by an increasing organizational size, the failure to be sufficiently vertically aligned, or simply as a result of failing to discard redundant processes (McLaughlin *et al.,* 2006; Goerzen, 2005; Kestilä *et al.,* 2007; Osborne and Brown, 2005).

However, identifying reasons for this unnecessary complexity is not the focus of this chapter. What is critical, is that organizations understand how to develop their core business processes so they become more resilient in the face of change (Maull *et al.,* 1995; Smart *et al.,* 1999) and ensure the sustainable transfer of business critical knowledge (Teece, 1998; Smolnik, 2005; Skyrme and Amidon, 1997; McLaughlin, 2009). Within an information-driven environment this becomes particularly vital as the need to understand and be able to respond to constantly changing customer requirements becomes a determining factor relating to an organization's continued ability to successfully compete (Bell, 1999; Tidd and Hull, 2003; Karmarkar, 2004). Abernathy (1978) observed that the rate of product innovation exceeds that of process innovation during the early stages of a product's life. Over time, processes tend to stabilise; however, the constant rate of change now experienced by most organizations undermines this stabilization. Processes quickly fall behind the rate of product development, thus leading to a situation where process performance becomes a weak link in an organization's ability to remain competitive (Lu and Botha, 2006).

10.2.4 Understanding the Knowledge Intensive Process

To understand how organizations approach process alignment, it is worth taking a look at how various types of organization approach this challenge differently. McLaughlin (2010) looked at how six separate organizations manage their core process development and the life cycles of these processes. Although the organizations studied were very different in terms of the services and products they offer, all were complex in nature, and were trying to deliver their offerings in a dynamic and changing

business environment. The study identified the main aspects of process control that the more successful organizations use, and proposed a framework for developing knowledge dependent processes for complex organizations.

Although the types of organizations selected for inclusion in the study varied quite significantly in structure and function, the research focused on process development from a knowledge enablement perspective. Once viewed from this perspective, key aspects of process development could be identified for comparison across the respective organizations.

In particular, the case study comparison looked at highlighting variations in how organizations approach process development (identify best practice), and how organizations with responsive processes develop their information/knowledge strategies. Looking across the case study comparisons McLaughlin (2010) identified some interesting emerging patterns.

- **Knowledge Understanding:** All respondents were able to distinguish the difference between tacit and explicit knowledge. However, although some placed a different level of importance on one over the other, this was mainly driven by an organization's existing information and knowledge requirements.
- **Knowledge Strategy:** This provided an interesting insight into how organizations, on understanding the meaning of knowledge, try to tackle the complex problems associated with "managing" knowledge. Organizations with less responsive processes had no clearly defined knowledge strategy, or at least no strategy that was linked to how their employees' access, create and share information/knowledge across the organization. In these cases, the strategy usually involved an organization-wide codified systems deployment that was focused on information storage and transfer.
- **Process Development:** This gave a very clear picture as to how the participating organizations go about the business of process development and management. All organizations developed their core processes centrally. However, organizations with responsive processes maintained future developmental control once the process had been deployed. Organizations with less responsive processes, although they were centrally developed, passed operational and developmental control over to the respective business units responsible for the day-to-day operational

management of the process. Post-deployment changes could then be made locally without any central review. This resulted in there being no definitive process descriptor available, and no clear understanding of the end-to-end impact of local changes.

- **End-user Involvement:** This was a key differentiator between the participating organizations. Those with responsive processes actively sought employee involvement with ongoing and future process development. By taking this bottom-up development approach the organization wanted to achieve two things. Firstly, the development of a more responsive process that was in tune with the end user's information and knowledge creation and sharing habits, and secondly, the development of a sense of ownership and "buy-in" from employees for the process.
- **End-to-end Connectivity:** All organizations believed this to be a priority in process development and management. However, only organizations with a responsive process maintained active control over process development throughout the process' life cycle. This allowed the "responsive process" organizations to better gauge the impact of potential changes across the entire end-to-end process.
- **Top-down versus Bottom-up Development:** Organizations with less responsive processes developed their processes from a top-down perspective, with little or no end-user involvement, and once the process was deployed, tended to pass operational and developmental responsibility over to the respective business units. Once this happened, operational process owners would modify their process to take into consideration local working practices. These changes would not necessarily be reviewed centrally and, therefore, the up- and downstream impact on the process would not be known.
- **Prioritising Change:** The success that organizations experienced in ensuring process change requests are prioritised in line with business objectives and with limited negative impact, was linked to the way processes were locally controlled. Prioritisation of change happened best where all process owners were involved. In this way, up- and downstream impact could be assessed and a decision to accept or reject the change request would be made on the basis of the overall benefit to the process and business objectives. Organizations that maintained local control of process development and change tended to have less responsive processes.
- **Ensuring Employee Buy-in:** Once the process was deployed, getting employees to use and accept it was a main consideration of

the speed at which the process was integrated into mainstream business operations. Once again, the participating businesses approached this differently. Those with less responsive processes depended on achieving buy-in once the process was deployed. A number of techniques are used ranging from on-the-job training to individual appraisals and reward schemes.

Organizations with responsive processes simply relied on employee buy-in being established through generating a feeling of ownership for a process they helped to design and deploy. Although these organizations also provided training (as not every employee could be involved in the development), the use of regular communications from the employee development team to the wider user community was felt to build confidence in the process, which in turn accelerated the acceptance of the process by the wider user community. Failure to communicate process changes from the top down was also seen as a contributing factor in preventing an acceptance of new processes in organizations with less responsive processes.

10.2.3 A Framework for Process Alignment

The review of how different organizations approach process development has helped to further understand how organizations in general approach the way in which they manage process development. By comparing organizations that perceived their processes to be responsive with those that did not, the stages in the process framework as defined in Figure 10.1, can be redefined. Figure 10.2 shows the redefined framework based on the findings as outlined in section 10.2.2.

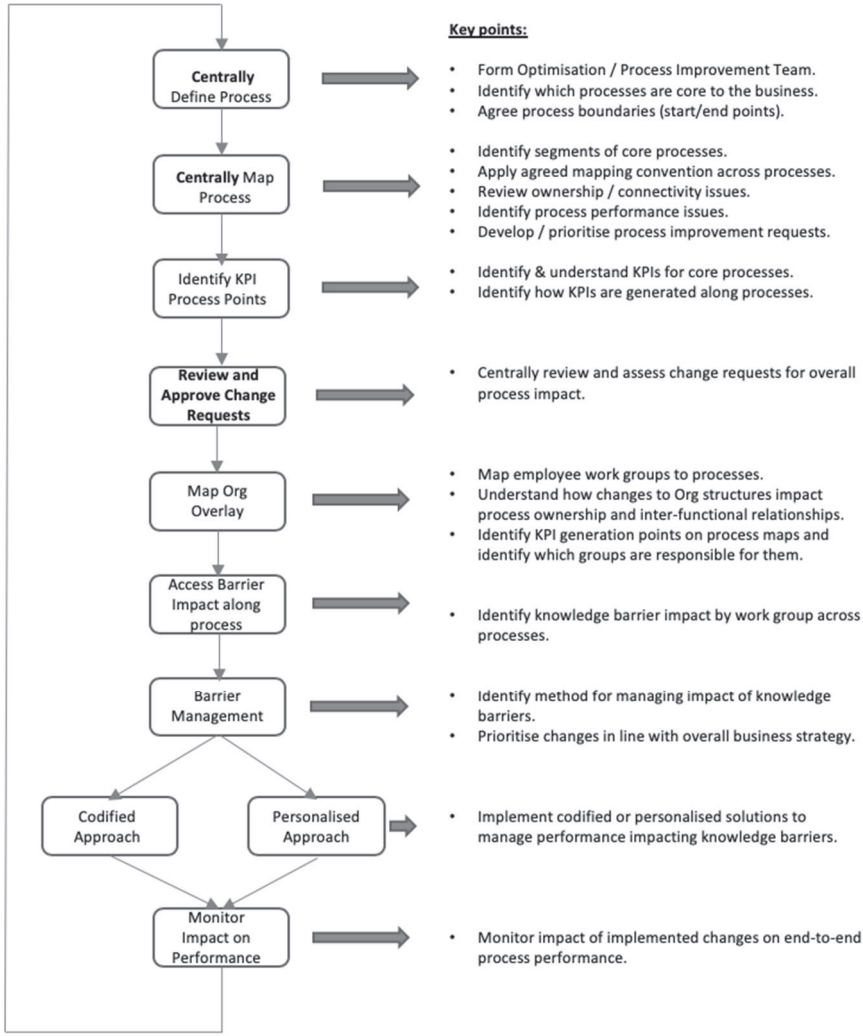

Figure 10.2: Framework for Developing Knowledge-dependent Processes

The original framework for developing processes (Figure 10.1) has been modified in line with the findings outlined by McLaughlin (2009) to produce the framework in Figure 10.2. When the importance of bottom-up, end-user involvement is taken into consideration, the original implementation

strategy process (Figure 10.1) changes. The first two steps are amended from "define" and "identify" to "centrally define" and "centrally identify" respectively. This emphasises the important role the centralised team plays in the overall development of the core process (McLaughlin *et al.,* 2006). An additional step is introduced after the "identify KPI process" step. The new step highlights the importance of ensuring process improvements are handled centrally; thus, ensuring up- and downstream impact assessments are made before any changes are implemented.

Another important consideration is the existence of different knowledge transfer barriers along the core process pathways (also refer to Chapter 7). Although, as expected, the barriers differ in appearance and impact depending on the organization, what is interesting is how the different organizations identified and managed the barriers. Evidence suggests that organizations with more responsive processes identify and manage barriers centrally from a bottom-up perspective allowing for the identified barriers to be considered during the development of their core processes. Organizations with less responsive processes tend to develop processes from a top-down perspective with little consideration given to barrier impact until post deployment. This can result in barrier issues being left to local management to resolve locally. This in turn can result in sub-optimal process operation leading to processes under-performing, or preventing the business from responding appropriately to changes in the competitive environment. Therefore, core processes are best managed and developed centrally, with change request prioritisation being handled by a centralised, process-aligned, cross-functional team. It is important that the cross-functional team is made up of employees familiar with the processes being worked on.

Many large organizations do not consciously develop a knowledge strategy, but rather allow one to emerge. This emergent strategy is influenced by existing information and data requirements and as such usually develops into a codified approach. Organizations that adopt a centrally driven, bottom-up approach to process development tend to use a personalised (team driven) approach to help identify specific knowledge barrier issues along the process, and agree on a suitable approach to resolve them. Therefore, in these organizations the knowledge strategy develops from a bottom-up perspective based on knowledge and information practices along core process pathways. This approach also allows the process team to identify barriers which surround the knowledge transfer cross-over points once the process has been rolled out. These are the points along the process

where codified and personalised knowledge transfer happens and which provide the largest potential for knowledge loss along the core process. As such their effective management provides the most potential benefit in optimising the overall process. Organizations which do not consider where these knowledge transfer cross-over points exist along their core processes leave the effective transfer of knowledge at these points to chance. Therefore, if an organization is to rely on an organization-wide, top-down, knowledge strategy this could result in a failure to properly manage knowledge barriers, which in turn will result in a process that will fail to reach its operational performance potential.

Time Out

Think about it: Do we really need to think of our processes as knowledge pathways?

Argon Ltd. is an online retailer providing a range of household and non-perishable personal products such as household furnishings, sports equipment, electronics and personal jewellery. The range is extensive and the company is perceived as the market leader. Argon Ltd. was set up in 1995 and has gone from strength to strength ever since. The CEO is Debra Icke, who has been in the post since 2005. During that time Debra has overseen the move to a more integrated online service where customers can now check the stock availability of products from any store, and order any time they wish. The continued operation of high street stores has allowed customers to come in and view items before purchase, thus reducing the concerns that many shoppers have over buying expensive items online.

For the last five years the product range has been relatively stable with little change to the types of products being sold. Because of this the Business Process Re-engineering Team at head office has developed all core business processes centrally. To date this approach has worked well.

However, competition is on the increase and Debra Icke and the Management Team are fully aware that they need to be getting closer to their customers in order to understand their changing requirements. The

product range gets refreshed every 12 months, but Debra now thinks this needs to be happening much faster – at least every 6 months if not every quarter.

Up until now much of the process development work has been focused on improving cost efficiency. The Re-engineering team has been using technology to automate as many of the processes as possible. Shaun Philips, Head of Marketing, says "…we should now start to see how we can better connect with our customers to get a better sense of what they are looking for". Debra knows that this makes sense, but is also aware that the focus on process development has been on removing manual input and unnecessary stages in the sales process. Because of this Debra isn't sure the current processes will support Shaun's view of a more "customer orientated" business. After all, all customer feedback is pulled from a customer survey held once a year through an in-store survey. Danii Mann (Head of Sales) says this approach has served them well so far and doesn't see the need to "…completely re-do all the processes to pull in real-time customer data". However, Lee Harwood (Head of IT) says that it wouldn't take much to increase the number of surveys conducted each year, and to provide access to online customers as well as in-store customers. Debra thinks they really do need more feedback and contact with customers but isn't sure that Lee's solution is right. Perhaps, she feels, they need something more integrated in terms of how the information from customers flows back into the organization…

Questions:

- Should the implementation of the customer feedback process simply be left to the IT group to implement?
- What do you think are the first steps Debra and the team should take in deciding on a new process?
- Do you think the development of the customer feedback process should be a collaborative endeavour? If so, who would you include in the development of the process and why?
- What other aspects of the business do you think the information from a customer feedback system could influence?

10.3 Core Processes along the Value Chain

How organizations align and manage their core business processes can drive significant performance improvement for their business models. This aspect of organizational or business operations is usually referred to as supply-chain management, and is seen by most organizations as a key strategic component for ongoing sustainability. We define a supply chain as follows:

*A **supply chain**, logistics network, or supply network is the system of organizations, people, activities, information and resources involved in moving a product or service from the supplier to the customer. Supply chain activities transform raw materials and components into a finished product that is delivered to the end customer.*

Organizations in general are now well aware of the components (sales, logistics, manufacturing, finance, marketing, etc.) that make up their supply chain. Indeed, these components are often well established and embedded. However, many still struggle with the problem of effective component alignment (Teece, 1998). Functionally aligned organizations may understand and individually manage their supply-chain components, but performance can only be maximised once they achieve the transformation to process alignment.

"Process aligned organizations focus on core process performance as opposed to functional business unit performance."
(van Weele, 2002)

This is a fundamental and key change for most organizations and one that they must make in order to fully develop their supply-chain capabilities (van Weele, 2002).

Function View	Process View
Focus on organizational hierarchy.	Focus on E2E key processes.
Process is difficult to define therefore difficult to monitor.	Supply chain performance can be monitored along a process.
Grey areas between functional process sections.	E2E process performance is a key objective.
Performance monitored by functional units.	Resources are mapped to a process.
Functional unit performance is a key objective.	

Table 10.1: Difference between a Functional and Process View

However, this shift in focus does not come easily to many organizations, as internal business unit boundaries can be difficult to remove (Argote *et al.,* 2000). The problem is exacerbated within complex organizations where capabilities such as manufacturing, logistics, and procurement have been outsourced, as is the case with many supply chains.

How any complex organization manages the re-alignment of supply-chain relationships must surely impact both immediate and future performance (Lee *et al.,* 1997; Troyer, 1995). Therefore, the implementation of a change programme dependent on developing more effective cross-organizational working relationships in order to improve the end-to-end performance will present a significant challenge. As discussed, performance is not simply down to the implementation of elaborate IT systems (Kotter, 1995), but requires the alignment of key personnel in an understanding of the knowledge management aspects relating to the end-to-end processes (Wiig, 1997; Tsoukas, 1996). This requires management to think about how the business operates from a process, as opposed to a functional, perspective (van Weele, 2002). Focusing on the value that each process brings to the supply chain as a whole, and then working to ensure only process activities that add value are included in the supply chain, can be considered a "**value chain**" (Xu *et al.,* 2009). A definition of a value chain (Porter, 1998) is as follows:

*"A **value chain** is a chain of activities across a supply chain. Products or services pass all activities of the chain in order, and at each activity the product or service gains some value. The chain of activities gives the products or services more added value than the sum of added values of all activities."* (Porter, 1998)

It is the demonstration of value that turns a supply chain into a value chain. As you can imagine, it will be very difficult to consistently deliver value from every process activity, considering the constantly changing business parameters under which the chain is striving to perform. Therefore, achieving "value chain" status is more of an aspiration which organizations continually strive to achieve, rather than something that is easily acquired and maintained.

10.3.1 Identifying your Core Processes

The core processes of many organizations will differ. Chapter 5 (Building Technology-based Capabilities) discussed the concept of dynamic capabilities. The link between certain capabilities and competitive advantage is an important strategic issue that organizations need to focus on. By building performance-improving capabilities that are hard to replicate, organizations can maintain a competitive position in their respective environments. Therefore, it is important that organizations understand the core processes that support their dynamic capabilities, and continue to manage them appropriately. From a technology perspective, Chapter 5 also introduces the notion of technology enabled and enabling business capabilities. These capabilities are important to the business, where technology can and does add significant value.

These dynamic capabilities and the emphasis on technical capabilities will vary from organization to organization, depending on their respective business models and strategic focus. For example, while Apple and Dell are both in the computer business and rely on all of the same supply chain processes to order, build and ship products, they focus on different capabilities in order to differentiate themselves in a very competitive market. In the case of Apple, they have developed a strong and differentiating capability in the form of their user experience and the design of their technology, whereas Dell excels in driving cost efficacy in their

manufacturing and logistics capabilities, which in turn make their products very competitive.

However, there are core business processes that are largely common to most organizations. These processes are necessary to run the business and keep operations moving. These processes are as follows:

Order-to-cash process: For most organizations, selling products or services is the main way of generating revenue. Figure 10.3 shows a generic order-to-cash process.

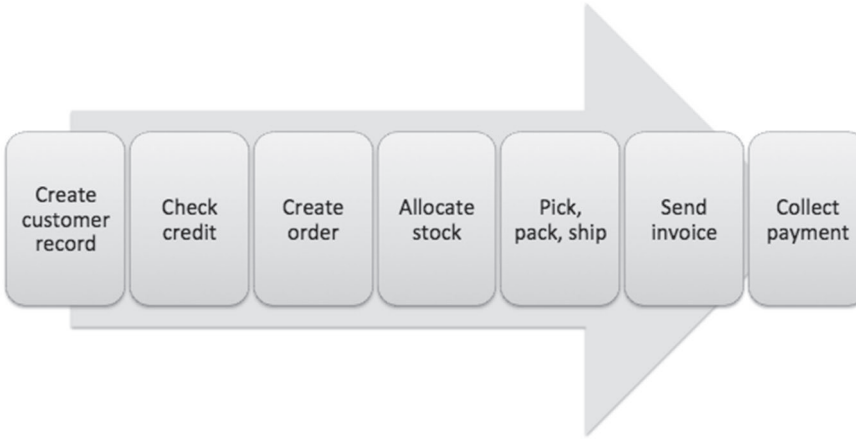

Figure 10.3: Order-to-cash Generic Process

Having an ineffective order-to-cash process can have a serious effect on organizational performance. For example, an ineffective pick, pack and ship process can see the wrong quantities being shipped to customers, which in turn can create additional costs in resolving customer complaints. Slow credit checking can also cause an unnecessary level of customer dissatisfaction and frustration. Also, failure to get invoices out to customers, or errors in invoicing can slow down customer payment processes, and can incur additional costs to resolve disputes concerning invoicing errors.

Procure-to-pay process: Organizations need to acquire raw materials or other products and services in order to meet their ability to service their own customers. Processes associated with the procurement of other materials,

services, or products from other suppliers are collectively referred to as procure-to-pay processes. Figure 10.4 identifies a generic procure-to-pay process.

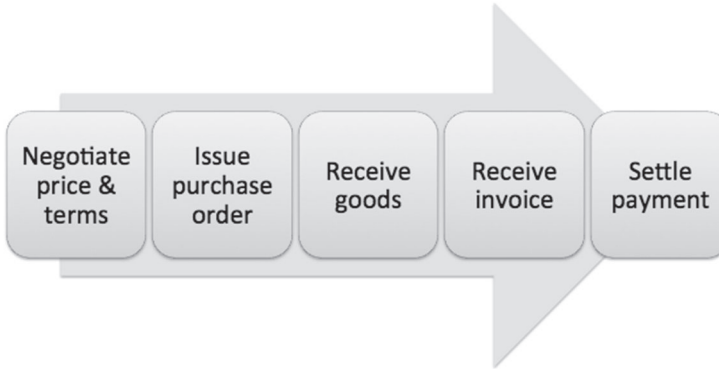

Figure 10.4: Procure-to-pay Generic Process

Once again, an ineffective procure-to-pay process can cause significant problems for an organization. For example, unclearly defined negotiations and terms can cause delays or unexpected price increases for the supplies necessary for the fulfilment of customer orders. This may result in unplanned price over-runs that may have to be passed on to the customer, or absorbed by the business. Delays in issuing purchase orders can result in delays in the supply lines, which in turn can result in delays in fulfilling customer orders, which can result is customer dissatisfaction. If the process isn't handling or recording goods received, the result may be the organization carrying unnecessarily high levels of stock, or not being able to find stock as it is required. Also, a failure to respond to received invoices may have a negative impact on the organization's credit rating and reputation as an organization that settles its debts on time.

Make-to-stock/Make-to-order process: This third set of core business processes is related to activities involved in making products or services. Organizations can approach the making of products in two different ways: make-to-order, or make-to-stock. Make-to-stock is usually driven by a forecasting plan where stock is built ahead of the expected demand (push-based approach). Make-to-order processes usually wait until an order has been received before the product is made. This (pull-based approach) is common in high-end luxury goods (suits, luxury cars, etc.) and services,

such as consulting, training, or the consumption of medical treatment. Figure 10.5 highlights the difference between make-to-stock and make-to-order generic processes.

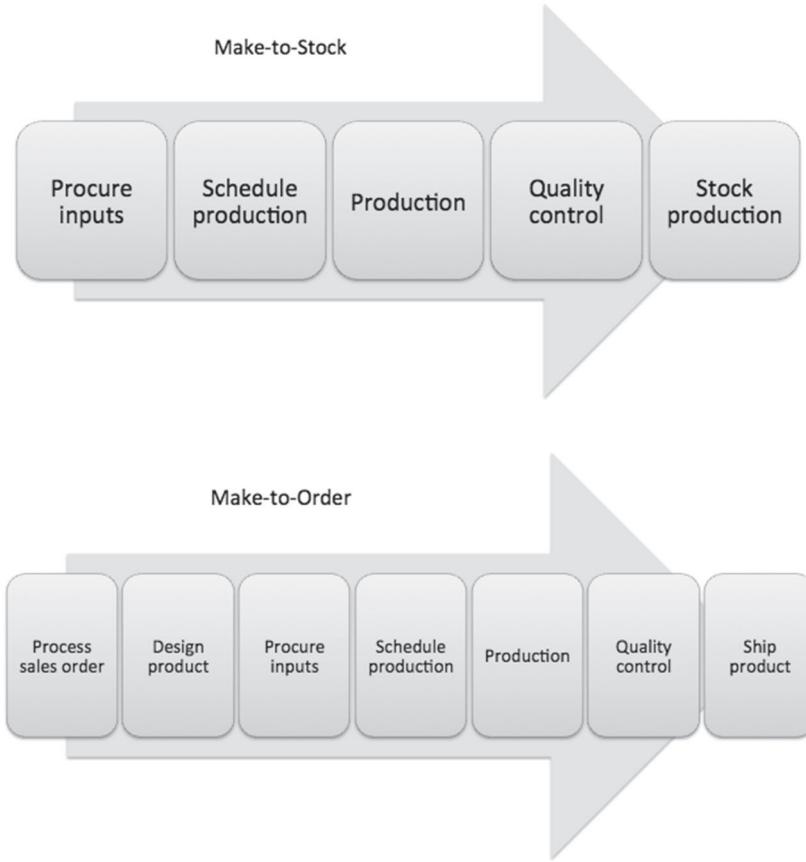

Figure 10.4: Make-to-stock and Make-to-order Generic Processes

As can be seen from the generic processes shown in Figure 10.4, the make-to-order process has two additional stages at the front end. In this process, production does not start until a customer sales order has been received. Do not think that one of these processes is better or more efficient than the other, what is important is the appropriateness of the process to the organization's business model. As with the other core processes, a failure to deliver

consistent and effective levels of performance at each stage can have serious implications for the organization.

However, for all of the core processes identified here, as well as for the dynamic capabilities that an organization might wish to develop, if applied appropriately technology can deliver significant improvement (refer to section 10.1.2).

10.3.2 Using Technology to Support Core Business Processes

Information must flow between the different business functions in order to effectively operate core business processes. The different functional areas (sales, procurement, finance, manufacturing, etc.) must share information and data. This is not new, as businesses have been using technology to improve the flow of information and data since the 1970s. The commercial availability of spreadsheets and databases has allowed organizations to improve their ability to forecast, invoice, and schedule orders. This has largely been achieved through the use of stand-alone applications. These applications have proved very useful at a functional level, but can prove to be difficult to use, access or interpret for users from different parts of the organization (e.g. people working in manufacturing looking for customer order data or sales forecasting data may not get the information in a format or timeframe useful for their needs).

This need to access information from any part of the business or organization, in an acceptable and relevant format and timeframe has become critical for effective core business process performance. Because many organizations have developed their processes and IT infrastructure over time, they find themselves with a collection of different applications and systems, which have been loosely connected together. As new applications are acquired, they are simply wired into the existing collection of systems as best as possible. These **Legacy systems** can prove problematic as the demand for information sharing increases in order to support core business processes and decision-making. This raises problems concerning the following:

- **Backward Compatibility:** What systems are compatible with each other? How can they be best connected even though they may not have been designed to work in the way the business now requires them to

work? Will new versions of technology still work with older versions (backward compatibility)?
- **System Support:** For older systems, is there still the same level of support available from the original vendor?
- **Configuration:** With the addition of new applications, what is the actual configuration of the system now? Is there a clear map of how everything actually connects together?
- **Control:** Some legacy systems may become less responsive to business needs, and therefore, different groups or departments will start to implement their own IT systems outside the organization's IT infrastructure or control. This is sometimes referred to as "**Dark IT**".
- **Data Currency:** With information being stored in multiple locations and formats across the organization, how can users keep track of the latest, and most accurate data?

Many organizations have turned to **Enterprise-wide Information Systems** (or **Enterprise Systems**) to help reduce the impact of the problems listed above. These systems, rather than storing information and data in multiple locations around the organization, provide a central repository for all information and data. The systems also provide a common user interface that allows users to enter, access, and share information and data seamlessly around the organization. Many of the more common enterprise systems now provide secure internet access via mobile technologies as well. In effect, enterprise systems look to support **internally focused** and **externally focused** systems.

- **Internally focused systems:** These support internal business processes designed to aid decision-making within the organization. These systems provide a network along which information flows within the organization.
- **Externally focused systems:** These systems support the coordination of business processes that cross the organizational boundary and connect with customers, suppliers, and other external stakeholders in the business.

Because of the complexity of business operations for many organizations, providers of enterprise systems tend to offer solutions in modular form, the intent being that each module will focus on a particular aspect of the business. So, for example, SAP is a worldwide provider of enterprise systems. However, SAP breaks down its offering into five areas:

1. Customer relationship management
2. Enterprise resource planning
3. Product life cycle management
4. Supplier relationship management
5. Supply chain management

Most of the other enterprise system providers, such as Oracle and Microsoft, align their enterprise system offerings in the same way. There will of course be some variation between the different systems being provided but fundamentally the objective for each is the same: improved organizational-level information-driven decision-making. In effect, each module is designed to replace a legacy system such as HR, manufacturing, finance, etc. This approach ensures the organization gets a replacement for its legacy system that provides an integrated data management system with a standard user interface for everyone across the organization.

10.3.3 Considerations for Implementing a Successful EIS

Every organization will align their core business processes differently, based on the funding available, the pressure to improve certain aspects of their core business processes, the strategic aims of the organization, and the efficacy of their existing legacy systems. What will be the same, is the expectation to create some level of competitive advantage from their core business processes and the technology used to support them.

However, the implementation of an enterprise information system is not a small task. Many organizations have struggled with getting an effective system in place, on time and within cost. It is not uncommon to expect that up to 60% (Langenwalter, 2000) of organizations will fail to realise the expected results, yet the majority of senior executives realise the importance of enterprise information systems to their organizations. EIS implementation will have a significant impact on the way people interact with the new systems and their work practices. As discussed in Chapter 8 (Information Systems – Shaping the Organization), if work practices, culture, and the political environment are not considered, the implementation of an EIS will be at risk of failure. That said, there are examples of organizations that have been successful in implementing this type of system. What these organizations have in common falls very closely

in line with what Kotter (1995) identified as being the main considerations for cultural change.

- **Establishing a sufficient sense of urgency:** Identify an executive sponsor within the organization who will drive a sense of urgency around why the EIS is needed and why everyone needs to support the implementation. Without this the project will fail.
- **Creating a powerful enough guiding coalition:** Identify and get key influencers from around the organization to support the project. These people will keep the momentum going in terms of support and goodwill for the project.
- **Create a vision:** The organization needs to create a vision of what the new system will bring in terms of benefits and improved performance.
- **Communicating the vision by a factor of ten:** Don't stop selling the vision. People will get distracted and seduced onto other projects. The organization must keep people focused on the project and what it will deliver.
- **Removing obstacles to the vision:** People will try to undermine the vision and the need for such a project. This may be through ignorance or as a deliberate attempt to stop the project for political gain. There needs to be a concerted effort to head off or stop any mis-information or active attempts to undermine the project.
- **Planning for and creating short-term wins:** EIS projects will take time to implement. As such, it is important to demonstrate the progress of the implementation when possible. This will create a good feeling and raise confidence in the system being implemented.
- **Do not declare victory too soon:** Make sure the project is not declared "online" and ready before it has been fully implemented as this may cause key stakeholders (sponsors, developers, architects, and user groups) to disengage from the development process before it has been finished. This may result in an incomplete system being deployed.
- **Anchoring change in the corporate culture:** Once the EIS has been activated success cannot be declared until the system has been fully integrated into the organization. Are people using the system in the way it was intended? Are they still using their old systems and processes as well? Even though the system may be deployed and accessible, if people are not using it as intended, then the implementation should not be considered complete.

Although Kotter proposed the points listed above to cope with cultural change back in 1995, they are still relevant today in the 21st century for

organizations struggling with the difficult task of installing enterprise information systems. If an organization intends to modify the way its people validate, create, access, and share information then it must consider the cultural aspects of how information and knowledge are handled.

Time Out

Think about it: From Legacy to EIS… what's the problem?

SensorLite is a company that has been in operation since 1982. Brothers, Mike and Dan Snow, who originally set up the company, have developed a cost-effective way of manufacturing thermocouples and photovoltaic sensors for industrial and commercial use. Mike now acts as Managing Director, with Dan assuming the role of Director of R+D. The business originally started out providing sensors to order to just three firms. This relationship stayed largely the same until 2005 with the customer base growing to just 10 companies world-wide, but with the volume of orders growing from an initial start of a few hundred components to nearing 5.6 million by 2005.

Until 2005 each of the different business functions operated relatively autonomously in terms of its information and data sharing practices. Information would be shared but it would usually flow up the management chain to the senior management team in terms of business unit reporting, and then be distributed around the organization after each weekly performance review meeting. This system worked well until 2006, when Dan Snow secured additional funding for sensor research. This allowed SensorLite to develop a whole new range of micro-components for the consumer electronics market, which in turn would open up new markets and increase their customer base. With the launch of the new components SensorLite's customer base jumped from 10 to over 250 customers in 12 months. Not all of the new customers were looking for the same volume of orders as the original 10 companies, but SensorLite did see a significant jump in volume from 5.6 million components ordered in 2005 to nearly 15.7 million components ordered by the end of 2007.

During this period of increased demand, the existing legacy systems seemed to feel the strain. Increased requests for customer information, order information, credit checking, order details, stock levels, pricing and discounts, and order details were causing a lot of stress amongst the workforce. The weekly output of data from the performance review meeting was not enough to meet the growing demand for information and data. Whilst everyone was happy to see the increase in business, the IT systems just didn't seem to be able to keep up and employees were creating all sorts of process workarounds and local systems to support their growing need for data and information.

Kai Tusamura, the Director of IT, presented to the management team on the current state of the IT systems and said that the IT legacy systems were at breaking-point, and would need a complete overhaul. Kai suggested that they consider replacing components of the legacy system with an enterprise information system (EIS). With a little additional help from outside Kai believed his team had the ability to deliver an EIS within 18 months.

Mike liked the idea of a more integrated system but couldn't help wondering if there was another solution. Should they opt for modifying the legacy system to reduce the level of disruption to the business? Surely this could be done on a process-by-process basis, which would be less traumatic for the business?

Questions:

- Do you think Mike's suggestion that they implement a legacy system update instead of an EIS implementation is a good one? What benefits does this have over an EIS implementation, and what benefits does an EIS implementation have over a modified legacy system approach?
- As the legacy system requires some form of upgrade or modification, what challenges should the organization consider if they do not opt for an EIS implementation?
- Do you think the work to upgrade the existing IT systems and infrastructure should be left just to the IT function to manage?
- Whatever option the organization opts for, the change will be significant in terms of its impact on the way people work across

the organization. How do you think Mike and the team can ensure, as much as possible, a positive outcome?

10.4 Learning Summary

Technology has progressed from simply automating basic repetitive processes to supporting the effective and efficient operation of core business processes. As organizations become more aware of the importance that processes play in connecting different parts of the business in a way that drives value for the organization, understanding the role that technology plays in enabling these processes becomes vitally important. It is important to remember that technology will not improve the performance of a badly designed and implemented process. For technology to provide any value it must be applied to a well-designed and fundamentally sound process.

In order to ensure business processes remain relevant, the activity of designing and developing processes must be seen as a core capability for the organization. In a dynamic operating environment this becomes vitally important as the need to continually update, improve and innovate around core business processes is necessary for building competitive advantage. For processes to continue to support a competitive business, the processes must be responsive to changes within the competitive environment. However, because of the traditional way in which organizations are aligned around business functions it can be difficult to allocate resources to processes as and when they are needed. Therefore, for organizations to better utilise their core business processes they should align their resources around these core processes as opposed to business functions. By taking a process view as opposed to a functional view of key resources, organizations will be better placed to allocate/re-allocate resources as and when they are needed, thus supporting more flexible and responsive processes.

It is also important to develop an organizational view of how processes operate and interact. By developing this level of process awareness the organization can better ensure that limited resources are being used appropriately to develop and improve the right core business processes.

Creating organizational awareness of the core processes opens up an opportunity to develop and implement processes in a more collaborative and innovative manner. However, there are challenges in even developing an organizational view or map of the core processes. Without doubt, the successful development of responsive and innovative processes is dependent on how the culture of the organization supports collaborative working. Developing a culture where collaboration is encouraged and supported across the organization will help to ensure processes remain relevant.

Considering that the nature of most businesses and organizations today is to connect with and respond to customer requirements, the need for information and data is paramount to successful engagement. Therefore, it is reasonable to consider core processes not simply as a chain of interdependent activities, but also as information or knowledge pathways. Processes must be able to transfer business-critical information and knowledge in order to support effective decision-making. Unfortunately, over time process innovation tends to fall behind product innovation, which in turn can lead to a situation where process performance becomes a weak link in an organization or business's ability to remain competitive. Therefore, the need to ensure continued process alignment is very important.

There are different frameworks for process development, but there are a few key considerations to remember when developing processes for organizations that perform process management well. One is the need to develop and centrally control an organizational view or map of the core business processes. End-user involvement is also very important as this ensures that end users establish a sense of ownership, and make sure that the planned changes are relevant. Finally, it is important to ensure that all changes are managed centrally. This will help to ensure that a valid and up-to-date map of the core processes is maintained.

The organization's supply chain is an excellent example of a process view of the organization. Organizations that invest in developing their supply chains tend to focus on core process performance as opposed to functional business unit performance. This process view requires an effective cross-organizational level of collaboration in order to improve end-to-end performance, which in turn can be difficult to establish. This shift in focus does not come easily to many organizations, as internal business unit boundaries can be difficult to remove. The problem is exacerbated within

complex organizations where capabilities such as manufacturing, logistics, and procurement have been outsourced; as is the case with many supply chains.

For many organizations, the focus and priority they place on the core processes will differ, especially concerning dynamic capabilities, which will vary significantly between organizations. However, there are three core business processes that will broadly be the same for most organizations. These are the order-to-cash, procure-to-pay, and make-to-order/stock process. For all three processes, a failure in effective implementation can result in a significant degradation in overall performance. However, technology can help to remove many of the more common errors and performance issues that beset less technology-enabled processes.

A significant issue with deploying technology to support core business processes is the need to manage existing legacy systems. These systems represent an existing technology that has been implemented at different stages and over time across an organization. The legacy systems can cause many problems when it comes to implementing newer technologies that may have compatibility issues with older technologies. One of the ways in which organizations get around this problem is with the implementation of enterprise information systems. These are integrated systems that are designed to replace legacy systems that support specific business functions (HR, finance, manufacturing, supply chain management, etc.).

Whilst the application of an EIS can remove problems associated with integrating new technology into legacy systems, the implementation itself can be disruptive to operational performance, costly, and time consuming. Many organizations have failed to effectively implement the EIS, however, the potential benefits still outweigh the risks for most senior executives. For organizations that do succeed in deploying an EIS the key is to treat the implementation as a form of cultural change. The implementation has a much improved chance of successful deployment by considering how the technology will impact work practice, culture and political boundaries, and managing them accordingly.

10.5 Case Study: NHS Patient Record System Failure

In 2002 the UK government launched an ambitious project to revolutionise the way technology is used within the National Health Service. Technology would be used to finally connect and manage electronic patient records, and integrate IT systems across hospitals and community care centres. The project, called the National Programme for IT (NPfIT), was expected to link the IT systems of separate health providers, called Trusts across England and Wales. The initial budget for the project was set at £6.4 billion. By 2011 the project was in disarray with costs exceeding £9.8 billion with no clear plan for when the project would be finally delivered. At this point, with pressure from the UK Parliament's public spending watchdog (Public Accounts Committee), the UK government cancelled the project.

Even with the project cancelled, MPs on the Public Accounts Committee expected the final costs for the project to exceed £10 billion, with UK taxpayers covering the cost of the failed project. Each of the Health Trusts has now been given permission to source and implement their own system based on their own particular requirements. In effect starting over again, but with £10 billion spent and little to show for it. On termination the of the NPfIT, a report into the failure was commissioned. The report highlighted significant failings in the ability to manage such a complex project, with Richard Bacon, an MP and member of the Public Accounts Committee, saying the report was further evidence of a "systemic failure" in the government's ability to draw up and manage large IT contracts. "This saga is one of the worst and most expensive contracting fiascos in the history of the (UK) public sector."

The project was launched in 2002 but was beset by changing specifications, technical challenges and disputes with suppliers which left it years behind schedule and over budget. In September 2011 the UK government announced it would dismantle the National Programme but, in an effort to salvage something from the failure, said it would keep the component parts in place with separate management and accountability structures.

In order to understand the problems that beset the NPfIT it is important to consider how the project was originally envisaged. The original driving force for the NPfIT was the Labour government, which was in power in 2002. This was a clear attempt by the government of the day to try and get some structure and connectivity across the NHS IT systems. The intention

was very laudable, however, fundamentally, this was still a political initiative and as such it was being driven from the "top down" into a very diverse and complex organization. Unfortunately, recent history is littered with politically motivated IT project failures. In fact, less than 10 years prior to the NPfIT the UK government lost £1.5 billion on a failed computerised benefits system to be installed at Post Offices.

This is also linked to the motivation for such an ambitious initiative. The project wasn't just going to develop information pathways linking primary and acute services, but was also going to fundamentally reshape how people access and act on the information that the system made available to them. Whilst the politicians were motivated to get this done, the problem was proving to be a bit more complex in nature as the NPfIT would have a major impact on the fundamental structure of the existing NHS systems. For this plan to stand any chance of becoming a reality the architects of the NPfIT would need to get the buy-in of the NHS staff who were expected to work with the new systems. It should come as no surprise that more that 30% of projects fail because of poor strategic planning and implementation. In many cases this boils down to getting buy-in from the stakeholders who are expected to adopt and work with the new systems. The project must be "sold" to the stakeholders and concerns must be addressed if any chance of a successful implementation is to be expected. In the case of the NHS the number of different stakeholder groups was significant; including nurses, doctors, physiotherapists, GPs, administrators, managers, pharmacists, house-keeping, social work, ambulance staff, etc. Getting buy-in would not be easy, but this is a key stage in planning for success. Unfortunately, even with external consultants, it was felt that this aspect of the project was not handled well. Many of the key stakeholders, such as GPs and hospital-based clinicians and administrators, expressed concerns about how the new systems would be accessed and used. For many stakeholders it was not even clear as to the overall scope of the NPfIT, and what would actually be delivered at the end of the project, or when that would be. It was felt that these issues were not being properly addressed. Therefore, this resulted in many stakeholders feeling excluded from the project. At a management level there was also growing concern over the lack of clarity around the project, and the growing fear that NHS management would lose control over their own IT systems – this resulted in suspicion and a lack of willingness to fully engage with the NPfIT consultants.

Certainly, one of the main selling points of the NPfIT was the promise of the faster access and improved efficiencies that the systems would bring to

the procurement and contracting processes. These processes handled billions of pounds per year in procuring supplies for the NHS and the proposed savings would be significant. However, clarity around how these improvements would happen was not forthcoming as many of the consultants responsible for the new systems were not that familiar with the idiosyncrasies of the existing processes. Concerns were raised when NHS management and clinical staff saw the haste with which NPfIT contracts were awarded. The contract scope was not defined or agreed in many cases before the contracts were awarded. Once again this only served to heighten concerns amongst NHS staff.

Because of the overall size of the NPfIT many of the contractors were under significant pressure to start work, and be seen to be making progress. This resulted in a culture of contract negotiation where contracts were offered on a "take-it-or-leave-it" basis, with little real clarity around the scope of work being offered. This aggressive approach to contract negotiation, with little room allowed for discussion around scope, resulted in a very adversarial relationship developing between the government and the various consultancies. Considering the complex nature of this project the development of an aggressive approach to supplier management is not conducive to developing a collaborative working model.

The NPfIT project team also looked to reduce risk by multi-sourcing contractors to work on similar aspects of the project. The intention was good as this would ensure aspects of the project would still be completed even if one contractor failed to deliver as planned. Covering the risk like this was not a bad plan, but it failed to consider the complexity of the project, and the real need for collaborative working amongst the contractors. Coupling this with extremely aggressive contract deadlines and having to work with other multi-sourced contractors meant that many consultancies operated in a very defensive and closed manner, with little incentive to actively collaborate.

In the end, the NPfIT staggered on for over seven years before a new government terminated the project. Why did the project continue to run for so long, especially when very little was ever delivered? The NPfIT was driven by a director with a very strong personality – which is necessary when trying to drive such significant change. However, when should the NPfIT project team, the government, and the NHS have realised that this project was not going to deliver? Surely, the writing had been on the wall

for some time, and with the cost overrunning to £10 billion shouldn't it have been stopped much sooner?

Questions

1. How do you think this project aligns to Kotter's (1995) considerations for cultural change?
2. The NPfIT was really being driven as an IT project. However, would it have been more beneficial to view it as a knowledge project? McLaughlin (2010) identifies some patterns that successful knowledge-centric organizations use to improve the efficiency of their knowledge intensive processes. How do these patterns relate to the way the NPfIT project was handled?
3. There was a lack of clarity around how the NPfIT would actually work. Assuming the project team was taking a functional view of the organization, how do you think a process view would have made things different?
4. If we look at this project from an information/knowledge perspective as opposed to a technology perspective would the use of the knowledge dependent framework (Figure 10.2) have improved the situation? If so, which stages of the knowledge dependent framework highlight areas for improvement and in what way?

10.6 Review Questions

True/False Questions

10.1 Technology can replace the need for business processes. T or F?

10.2 The main use of technology is automating simple repetitive tasks. T or F?

10.3 Technology can influence the quality of decision-making across an organization. T or F?

10.4 Technology will help transform bad process performance into good process performance. T or F?

10.5 Having the latest technology will always put an organization out in front of the competition. T or F?

10.6 A process is a collection of interrelated tasks performed to achieve a desired outcome. T or F?

10.7 Capability management is not concerned with process development. T or F?

10.8 Processes are concerned with the performance of non-strategic tasks. T or F?

10.9 Technology can help to improve both the quality and scale of process outputs. T or F?

10.10 Processes need to be able to flex and respond to changing business needs. T or F?

10.11 For processes to be more responsive they must be functionally aligned. T or F?

10.12 Most resources are aligned around functions and not core processes. T or F?

10.13 A value chain is a supply chain whose activities generate value. T or F?

10.14 For process innovation to flourish collaboration must happen. T or F?

10.15 Culture now has real influence on the development of responsive processes. T or F?

10.16 For processes to add value they should be considered as information and knowledge pathways. T or F?

10.17 The increasing complexity inherent in legacy systems can be due to the failure to discard redundant processes. T or F?

10.18 A top-down approach to process development is necessary to ensure robust and responsive processes. T or F?

10.19 Dynamic capabilities will differ from organization to organization. T or F?

10.20 There are three generic core business processes that are common to most organizations. T or F?

10.21 Legacy systems provide a good foundation on which to build enterprise information systems. T or F?

Multiple Choice Questions

10.22 Which of the following is focused on developing an ability to produce a desired, repeatable output to a predetermined quality and quantity?

A. Capability-centric
B. Functionally-centric
C. Product-centric
D. Process-centric

10.23 Which of the following would not normally be considered a way in which technology can assist process implementation?

A. Time to develop
B. Time to implement
C. Monitoring and control
D. Increased manual intervention

10.24 Which of the following would not be considered a stage in developing effective process development (Boddy, 2009)?

A. Align IT/IS to processes
B. Implement process changes
C. Acquire funding for changes
D. Develop an organizational process view

10.25 Which of the following is not an area where you would expect an overarching view of core processes to facilitate better decision-making?

A. Process alignment
B. Process criticality
C. Process accessibility
D. Process prioritisation

10.26 Which of the following is not an action for supporting collaboration around process development?

A. Stimulating cross-boundary innovation
B. Motivating employees
C. Modifying work practices
D. Automating work practices

10.27 When developing responsive aligned business processes which of the following is not a key stage in the development framework?

A. Centrally defined requirement for process change
B. Centrally defined process
C. Centrally mapped process
D. Centrally reviewed/approved change

10.28 Which of the following does not define a process view?

A. Focus on E2E key processes
B. Performance monitored by functional units
C. Resources mapped to process
D. Supply chain performance that can be monitored along the process

10.29 Which of the following is not a core business process?

A. Order-to-cash process
B. Procure-to-build process
C. Make-to-stock
D. Make-to-order

10.30 Which of the following will not really help improve the chances of a successful EIS implementation?

A. Establishing a sense of urgency
B. Not declaring victory too soon
C. Communicating the vision
D. Building a working prototype

10.7 Review Question Answers

True/False Answers

10.1 F, 10.2 F, 10.3 T, 10.4 F, 10.5 F, 10.6 T, 10.7 F, 10.8 F
10.9 T, 10.10 T, 10.11 F, 10.12 T, 10.13 T, 10.14 T, 10.15 F
10.16 T, 10.17 T, 10.18 F, 10.19 T, 10.20 T, 10.21 F

Multiple Choice Answers

10.22 D, 10.23 D, 10.24 C, 10.25 C, 10.26 D, 10.27 A, 10.28 B

10.29 B, 10.30 D

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Chapter 11: Securing Your Information in a World of Open Access

Learning Objectives

On successful completion of this chapter the student will be able to:

- Articulate how advances in technology can both undermine and enhance our ability to secure our information and data.
- Understand why all IT systems connected to the internet are at risk of attack, and what motivates such attacks.
- Describe the main types of information security breach that organizations are exposed to.
- Describe the three main ways in which information and data can be compromised, and how to reduce the risk of a breach.
- Understand the need for an information security framework, and identify the core components of such a framework.
- Discuss why data protection legislation is necessary, and how the General Data Protection Regulation works to protect personal data.

11.1 Introduction

One of, if not ***the***, most important assets for many organizations is its data. Whether it's customer data, financial data, performance data or data relating to intellectual property – this is the core resource for the knowledge-based organization. Indeed, as Clive Humby (mathematician and architect of the Tesco customer reward card) said "data is the new oil". Where these data reside, who manages them, who has access to them, and how unique they are, are important questions for the organization. Recent advances in technology have seen the physical and virtual barriers used to protect data being dismantled. Employees and customers demand more transparent access to information; the implications of which need to be properly understood and managed accordingly. This increasingly complex challenge

is requiring organizations, in many cases, to make the choice between speed of access, and information security.

Within our private and professional lives, we now find ourselves in a constantly connected world, where devices that connect to the internet surround us. We've moved past the point where we just need to consider the connectivity of computers and laptops, now we're connected through our phones, watches, fitness trackers, tablets, cars, TVs, fridges and all manner of other household appliances. Whether you believe this is a step forward in the advancement of humankind, or a direct threat to our ability to socialise on a personal level, the fact is that technology has significantly impacted the way we access and communicate information.

This heightened level of connectedness with employees, customers, and third-party businesses has increased exponentially the number of individuals (and organizations) looking to access an organization's systems via their own devices. Now that many of the technical challenges associated with sharing and accessing data have been resolved it is important that anyone making strategic business decisions understands the implications of granting or denying access to data. In a fast-moving competitive environment, who gets access to data can be the difference between gaining competitive advantage or sustaining significant reputational damage. Not all data breaches are because of the exceptional skills of the hacker community, sometimes data are simply given away without any thought to the consequences. Examples of this type of failure are not uncommon as the recent case of Facebook and Cambridge Analytics can testify. In this instance, 50 million Facebook profiles were accessed in 2014 by Cambridge Analytics, without personal authorisation, through careless data handling procedures. Another example occurred as recently as 2019, when sensitive patient data were sent in an email to an unauthorised distribution list. In this case, the breach occurred within the National Health Service (NHS) in Scotland. A salutary lesson appears to be that just because an organization is big and well established doesn't mean it is immune to breaches in data security.

Irrespective of how data gets out, or are accessed by the "wrong" people, the reputational damage can be something your organization may not be able to recover from. The fact is that unauthorised access to data is a real threat to any and all organizations, and no organization is too big to be totally safe. There are technology solutions that continue to increase in complexity and strength. However, the weakest link is still the human

element. Whether it's keeping your password on a Post-it note on your monitor, or bringing sensitive work home, or simply emailing documents to people without checking the email addresses as they are auto-filled by your email programme. In many cases, people inadvertently take risks with data that are unnecessary.

This chapter will introduce the concept of how to protect the integrity, confidentiality, and availability of data. We will also be looking at basic security practices for ensuring the organization's information remains secure, but accessible to the right individuals.

11.1.1 The Changing Landscape

It is quite common to hear security consultants, when talking about data security breaches, to divide organizations into two camps; those that have been the victim of a security breach, and those that don't yet realise they have been the victim of a security breach. This is a bold statement for sure and one that is designed to shake organizations out of a state of ignorance or complacency. However, the point is still worth considering. Organizations are under threat not just from physical breaches but also from digital breaches in security. The scope of the breaches ranges from internal access permissions being incorrectly set or updated resulting in unauthorised access to certain data to cyber-attacks designed to steal customer data or deny access to corporate websites on a global level. The types of attack can also be either covert or overt. All in all, and without being melodramatic, the threat to an organization's data is real, and relentless. The problem is also one largely created by technology itself. Rapid improvements and advances in connectivity, storage/retrieval, computer literacy, homogenization of technology, internet access, and data value, have seen a growing fraternity of hackers, and as a counter, IT security analysts. In effect, technology has created an environment in which a black market for data has begun to flourish, and all you need to operate within this market is a computer, internet access and some programming knowledge… and a low moral threshold.

Looking at some of the main factors (Table 11.1) as to why this fertile environment has developed, which in turn has seen a growth in attempts to access organizational data, will help to clarify why organizations now find

themselves in a relentless, and constantly changing battle to keep their data and systems out of the reach of unauthorised individuals.

Factors	Explanation
Growth in Connectivity	People are looking to access systems from all sorts of devices, such as computers, phones, tablets, TVs, car navigation systems and entertainment systems, and any device with an IP address (Internet of Things). The development and advances in cloud technologies have seen a near exponential growth in the number of devices, both mobile and stationary, now connected to the internet.
Improved Storage/Retrieval	Reduced cost of storage has seen the rise in low-cost cloud storage facilities. With this rise many organizations are now looking to low-cost solutions for data storage. This can also be seen in the rise in demand for network access storage (NAS) devices for both business and home use. These devices usually come with additional internet access and security.
Improved Computer Literacy	Programming skills are now generally accessible at all levels of education. Many courses now have a computing/programming component as part of their core curriculum. This has served to widen access and develop a generation of people more comfortable with programming concepts and techniques.
Homogenization of Technology	Many of the components used in branded technologies are now commonly used across most manufacturers. For example, hard drives, memory, and processing chips are commonly used by computer manufacturers such as Dell, Lenovo, Apple, Acer, etc. Also, many of the software protocols are standardised; such as internet access protocols. This means it is easier to move between technology platforms for both legitimate and unauthorised users.
Rise in Data Value	As Clive Humby said back in 2006 “Data is the new oil”. Since then we have seen the steady realization amongst organizations of just how precious their data are. In many cases, a company’s data are the most important asset it owns. Because of this there will be an increased demand to access and capture these data.

Access to High-speed Internet	Growth in access to high-speed broadband is now a national priority for many countries. This allows more people faster access to online servers and services such as data storage and retrieval, and running application software across networks and the internet.

Table 11.1: Environmental Factors for Growth in Data Breaches

The factors outlined in Table 11.1 are not extensive; however, they do demonstrate the scope of change in terms of cost, speed, access, and intent that enables and encourages data security breaches.

What is worth considering is that a data breach can be unintentional, intentional, physical or digital. One shouldn't always assume that the only risk to your data comes from hackers who prowl around the dark web looking for weaknesses in your organization's firewalls – although hackers are constantly on the lookout for openings into your networks. Let's take a broader look at the types of breaches in order to get a better idea of the manner in which confidential data and networks can be compromised.

Unintentional Breach: This is where there is no malice intended, but the actions of a system or person(s) may expose sensitive data to unwarranted levels of access. This could be through an individual leaving his/her laptop, phone or tablet on a train, or in a cab, etc., or leaving a password on a Post-it note attached to a computer, or even leaving a secure access door jammed open to improve air flow around a warm office. All of these actions could be seen as unintentional but resulting in data or systems becoming unnecessarily vulnerable to attack.

Intentional Breach: This is where there is a deliberate and intentional desire to expose data or systems to attack. This could be a disgruntled employee selling, accessing and sharing sensitive information, or an individual or group intent on undermining the credibility of certain individuals or the organization. A recent example of this is the leaked email from Sir Kim Darroch, UK Ambassador to Washington, in which his comments were less than complimentary about the US President, Donald Trump. The leaking of the email caused some embarrassment to the UK Government, and the subsequent resignation of the Ambassador in July 2019.

Both intentional and unintentional breaches can be further sub-divided into either physical or digital breaches.

Physical Breach: This is where data or systems are physically accessed without the necessary authorisation. This could be where an unauthorised person physically accesses a computer or mobile device connected to the network. They may have found a connected device, or gained physical access to a secure location containing sensitive information. The breach could either be unintentional or intentional in nature; however, either way the access is not authorised or sanctioned. An example of an **unintentional physical breach** could be someone leaving the door to a secure location such as a computer room, jammed open to improve air circulation or ease of access, or someone taking work home and leaving on a bus a file containing sensitive information, such as financial or customer data, or plans for a new product or service. **Intentional physical breaches** manifest when an individual or group of individuals deliberately sets out to gain physical access to secure data or information systems. In organizations where physical security is present, this can cause those intent on causing a breach some difficulty. However, using false identification to gain access to a building or location, or physically breaking into a secure area can provide the necessary access. Blackmailing or threatening employees with violence can also often result in information falling into the wrong hands.

Digital Breach: This is probably the most commonly discussed form of data or network breach when unauthorised access to data or systems is gained through the very systems themselves. Once again, this type of breach can be either unintentional or intentional in nature. However, as with a physical breach, ether type can be equally disruptive and damaging to an organization or individual. **Unintentional digital breaches** may develop through inherent design weaknesses in the software systems being used by an organization. In 2017 it became apparent that in England the medical records via the general practitioners' (GPs') patient record system, of approximately 26 million patients, could be accessed by unauthorised individuals. Fortunately, this weakness in the system was discovered and fixed before any records were compromised. **Intentional digital breaches** are, unfortunately, far more common that you would think. Deliberate attacks on individual and organizational systems are happening all the time, and range from attempts to deface or shut down websites, to computer hacking targeted systems for very specific information such as customer or financial data.

A big problem with ***intentional breaches*** is that the amount of damage caused will depend very much on the motives of the individual or individuals doing the hacking. Even though your company may simply make wooden whistles or hairbrushes, someone somewhere will want to access your systems just because they see it as a challenge. However, others, unfortunately, may have more malicious intentions.

That said, even though this book is about the business value of technology, don't lose sight of the real risk of physical breaches. Not all breaches happen because of cutting-edge programming skills – simply leaving the wrong door open, or an unattended office unlocked can give an opportunistic data thief all the opportunity they need.

11.1.2 Main Reasons for Concern

In olden days, when computers were not connected to the internet, if you wanted to get data from computers you first needed to physically access the computers. As we've seen with the advent of more affordable internet access, most people's devices are now constantly connected to the internet. This increased connectivity brings with it additional security risks, and in many ways the internet is changing the many outdated assumptions that people have historically made about computer security and publishing. Therefore, a higher level of connectivity raises the following concerns:

- **The internet is a two-way network:** It can provide access to private computers/networks for unauthorised users or hackers.
- **The internet is increasingly being used for transactional processes:** Therefore, reputations can be damaged if money/data are compromised.
- **Software applications are not without their flaws:** Although internet interfaces are becoming easier to use, they are complex applications that can contain software flaws that may allow unauthorised access to user data.
- **Simply accessing the network is enough:** Once server access is acquired the server can then be used as a launch pad for further attacks on other organizations/users.
- **Default passwords:** Current software asks users to make security-relevant decisions on a daily basis, yet users constantly look for ways to circumvent or simplify the authentication processes, the most

common being using one password for all applications, or failing to regularly change passwords.
- **Prevention is better than the cure:** It is considered more expensive and time consuming to recover from a security incident than to take preventative measures ahead of time.

All of these reasons for concern should encourage any individual or organization to seriously consider how they control access and secure their data and information systems. According to Laudon & Laudon (2015), if you are connected to the internet you need to make security and control a priority.

Security – *This refers to the policies, procedures, and technical measures used to prevent unauthorised access, alteration, theft, or physical damage to information systems.*

Controls – *This refers to methods, policies, and organizational procedures that ensure the safety of the organization's assets, the accuracy and reliability of its records and operational adherence to management standards.*

In 2019 the UK Department for Digital, Culture, Media and Sport published its annual report titled "Cyber Security Breaches Survey 2019". This report looks at the extent of the security problem for organizations across the United Kingdom. Between 2018 and 2019, out of 1,566 UK-based businesses surveyed, 32% had experienced a breach or attack in the last 12 months, of which 61% of the large firms surveyed had also experienced a breach or attack. What the survey also found was that personal or customer information was the biggest attraction for hackers.

11.1.3 Motivation and Types of Attack

What motivates an individual or group of individuals to deliberately set out to access and undermine an organization or individual's personal information? Certainly, there are many reasons, some of which have become more apparent in recent years ranging from the advent of WikiLeaks and their endeavours to expose, what they believed to be unethical and secret government activities, to hackers gaining access to customer card payment details (as was the recent case in January 2019 for

DiscountMugs.com). These breaches happened for very different reasons – but they were still equally devastating for the target organizations. Some of the more common motivational drivers are listed below:

- **Reputation Building:** A successful attack on a server is a public event that may be seen by millions of people. Hackers may use attacks to build their reputations within the hacker communities.
- **Financial Gain:** Web servers have become repositories for sensitive financial data. Access to this type of information can be used or sold on for profit.
- **Proprietary Information:** Organizations use web servers to distribute information internally and externally to strategic partners. Getting access to this type of information may give a competitor a competitive advantage.
- **Personal Challenge:** Hackers may simply see an organization's security as a challenge to their own personal abilities.
- **Moral Righteousness:** The attack may be motivated by the belief that an organization or individual is involved in morally questionable activities which the hacker believes need to be exposed or stopped.
- **Political Advantage:** Attacks may be staged to help undermine a political candidate or party in order to ensure an unfair advantage for a preferred political ideology.
- **Economic Advantage:** Hackers may target financial institutions or key economic industries by trying to deny access to their information systems. This is designed to induce uncertainty and fear in investors.
- **Military Advantage:** Attacks may deliberately target key military installations in an attempt to undermine the effectiveness of personnel and systems, and the ability to respond to any perceived threats to national security.

This list is not exhaustive but it does give you an overview of the main motivations driving attempts to breach an organization or individual's information system. Some of the more common types of breach are listed below. However, remember, that even though these breaches may be intentional or unintentional in nature the outcome can be equally damaging.

Types of Breach	Unintentional example	Intentional example
Infection by viruses or malicious software	Staff member transferring material between their personal and work computers	Individual deliberately sends an email or web link with an embedded virus as an attachment.
Staff misuse of information systems	Staff member accessing sensitive information in an unsecured location such as a coffee shop/train/plane. Or failure to update access lists when people leave an organization. Lack of awareness of data protection legislation.	Unapproved individuals being given access to confidential information systems by disgruntled employees. Blatant contravention of data protection legislation.
Attacks by an unauthorised insider or outsiders	A design fault in an app/website may provide an end user with the ability to access sensitive data such as customer information.	A deliberate attack to deny access to the organization's systems via the internet, this is commonly referred to as a denial of service (DoS) attack.
Theft or fraud involving computers	An opportunistic theft of a computer containing confidential information from a car, or left on a train.	A targeted theft of a computer or password that would allow unauthorised access to sensitive data.
System failure or data corruption	A failure to carry out a regular back up of systems and data which leaves the systems at risk of loss of data should a hard drive fail. Or data corruption due to a poorly carried out systems update.	This may result from the introduction of a virus to the networked system, or through unauthorised access by external parties specifically targeting the organization.

Table 11.2: Types of Data Breach

The types of breach discussed in Table 11.2 provide a very general overview of the manner in which systems can be compromised. The important thing to remember is that a breach is not simply down to an external malicious hacker's intent on taking down your organization. Breaches can and do

happen because of unguarded and unintentional actions of people within the organization.

11.1.4 Assessing the Risks to your Organization

Being aware of potential threats to your information systems is an important step in the right direction, and so is being aware that any of these threats may manifest at any time. However, in order to mitigate for any of these threats the organization needs to be able to assess the risk to the organization should any potential threat be realised. An important point is the use of the word "mitigate" in the previous sentence. As with all risks you can never fully remove the chance that they may happen, but what you can do is mitigate the risks in a way that will hopefully reduce the impact such a risk can have should it happen.

The first step in assessing risk is to identify as many potential risks to your information/data that you can come up with. These don't just include threats but also vulnerabilities, or aspects of your organization's work practices and policies, employee skills, and system architecture that may leave the organization open to compromise.

As discussed in Chapter 6 (IT Governance and Risk Management), developing a capability to assess and manage risk is vitally important for good IT and corporate governance. Remember, that good governance should also ensure that all aspects of information security and control are understood and in place across the organization. If an organization is unable to assess risk for its data and information then, as one would expect, it will not be able to provide any level of assurance when assessing for risk.

Access to information systems and data assets can often be difficult to control, especially in a dynamic and constantly changing business environment. Therefore, it is important that the assessment of risk must be conducted on a continual basis. As Colman (2011) believes ***"…the art of risk management is not just in responding to anticipated events but in building an organizational culture that can respond quickly to risks and withstand unanticipated events."*** In order to achieve this, an organization needs to establish a risk management capability that exists at all levels throughout the organization.

According to Chaffey & White (2011) (as discussed in Chapter 3: From IT to Digital), the key generic stages in a risk management process are as follows:

1. **Identify risk:** This includes assessing the probability of failure and success. This can be visualised in a matrix as in Figure 11.1 below.
2. **Identify options:** What can the organization do to mitigate any of the identified risks?
3. **Implement options:** This should focus on targeting the option offering the highest impact and most likely risks.
4. **Monitor/Learn:** Monitor the progress and learn from the decisions made.

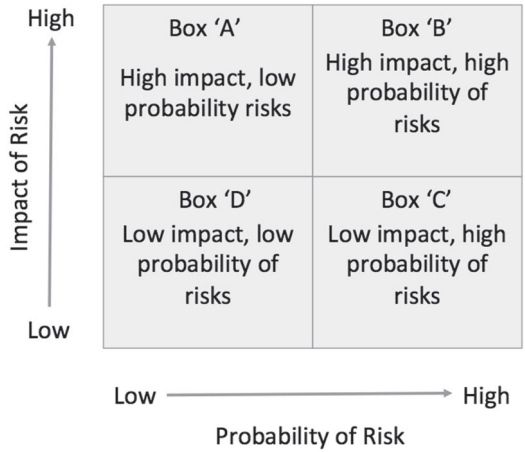

Figure 11.1: Risk Matrix (Chaffey & White, 2011)

Once the risks have been identified and the options defined, they can be placed in the matrix (Figure 11.1). For example, the options that fall into Box "A" are risks that are least likely to happen (low probability), but if they did, they would have a high impact on the organization. Risks that fall into Box "B" have a high probability of happening, AND a high impact on the organization. Therefore, the risks residing in Box "B" need the highest level of focus to ensure measures are in place to mitigate for these risks. At the other end of the scale are the risks residing in Box "D". These risks pose the lowest likelihood of happening, and even if they did, they would have a low impact on the organization.

It is important to remember that risks may move from box to box over time. A risk that was considered low in probability may become more likely over time due to any number of factors. The level of impact can also change. Therefore, organizations should treat this risk matrix as a "living" model that continually needs to be reviewed and updated.

An effective risk management process and capability will not only help to safeguard the organization against unanticipated threats/breaches, and mitigate for them, but will build confidence in the organization's ability to take advantage of opportunities that promise significant business value.

Once the risks and vulnerabilities have been identified and assessed for potential impact, then, as part of the risk management process (RMP), the organization, or more specifically, the senior management team needs to identify options to reduce the potential impact should any risk materialise. A key factor in developing a successful RMP is being honest and realising that the organization does not have effective options to deal with all identified risks at that time. Therefore, there will be the strong temptation to ignore certain risks that currently have no clear immediate solution. After all, if you can't do anything about a particular potential risk there's no point in tracking that risk, right? This would be a serious mistake, as ignoring risks should never be an option.

Once the risks have been identified and plans to mitigate their impact (where possible) have been identified, then ownership must be allocated to each risk. In this way individuals across the organization are identified and held accountable for ensuring risks are managed whenever possible. Progress is then tracked for each risk. A method for helping to identify and manage risks of all types is the implementation of a **Risk Register**. The main benefits of a risk register (RR) are as follows:

- The RR provides management with an up-to-date, holistic view of all identified risks potentially impacting the organization.
- The RR provides an update on the progress/lack of progress in mitigating for identified risks.
- The RR shows accountability – who is responsible for which risks.
- The RR identifies potential gaps and overlap areas for activities focused on risk mitigation.
- The RR forms part of the governance system and demonstrates to the board the level of focus the management team has on potential risks.

For the RR to be effective the senior management team must review it on a regular basis: which could be weekly, monthly or quarterly. The frequency for review will be influenced in no small way by the probability of certain risks happening.

Time Out

Think about it: Changing Access Requirements

SensorTech Ltd. (STL) has been developing high-end sensors for precision engineering and the geology industries since 1985. Their technology can be found in devices ranging from precision seismic detection equipment to thermal and pressure sensing equipment, used in extreme regions such as the arctic, deserts, oceans, and space. The designs and technology are proprietary to STL, and whilst there are few players in the sensor market operating at such a high specification level, the business has proved to be very profitable. Diane Law is the CEO and founder of STL, having started the company after graduating from university with a master's degree in engineering. The company is relatively small with only 65 employees based at three locations; Brisbane (Aus), San Francisco (US), and Shenzhen (China). The main administration and design centres are located in San Francisco with a small sales and marketing office in Brisbane, and the main manufacturing happening in Shenzhen.

Diane's COO is Brad Hadder, and the CTO is Geoff King – both of whom Diane has known since college. Until recently, Salma Choi handled Sales and Marketing. Salma was considered one of the "team", a close friend to Diane, Brad and Geoff and with the company for nearly ten years before leaving. As with all small dynamic companies' things happen quickly and the pressure to deliver is never-ending. As such all the senior team would spend upwards of 70% of their time travelling. To that end mobile technology was an absolute must for all those needing to travel to customer sites or visiting the manufacturing site on a regular basis.

In recent months STL has been considering moving into the medical device and defence contracting industries as the specifications on their sensor technology is high enough to meet the demanding specification requirements for both industries. As such Geoff and the rest of the management team are spending a lot of time seeing how they can ramp up production to meet expected demand.

Time moves on and it is now three months since Salma Choi left STL to pursue a further qualification in strategic marketing at college – a personal goal she has had for some time. As a goodwill gesture Diane allowed Salma to keep her laptop, monitor and printer, as this would be one less expense when going back to graduate school. Considering all the good work Salma did for the company it was felt that was the least they could do.

Meanwhile, negotiations concerning new contracts to provide sensors are going well, but the details are very sensitive. In order to keep everyone up to speed the senior management team and key employees are using email, team rooms, and wiki sites to keep in touch and hopefully improve decision-making. The products they use are "off the shelf" applications with no encryption.

On a recent flight from China back to the US Diane was reading an article about the rise in cyber-attacks on large financial corporations in London and New York. Diane thanked her lucky stars that they were not in the financial sector, and that STL was a small company operating in a very niche market. However, the closing statement in the article talked about two types of company – those that have been hacked, and those that don't know they've been hacked. Probably a bit of scaremongering on the part of the author to drum up interest, but she'd mention it to Geoff anyway.

Questions:

- STL is a small company making a product that nobody really knows – surely there's little interest in what they make? Is this a good way to view the company?
- The company is trying to close new contracts with new customers. How could an unintentional or intentional breach impact their credibility with new (and existing) customers?

- Letting Selma keep her laptop as a goodwill gesture is a nice act, but is it ultimately naive, and risky on the part of STL?
- In terms of how the senior management team keep in contact, and more specifically, the application software they use – is it fit for purpose in terms of ensuring confidentiality?

11.2 Understanding the Threat Environment

So far, we have discussed how threats and breaches may manifest, and the impact they can have on an organization in terms of reputation, operational capability, and the ability to remain competitive. The threat to an organization's security is real and ever present, and a failure to realise this simple fact can result in very serious consequences for all involved. Examples abound of organizations that failed to adequately protect their information and data resources. For example, back in 2013 the US internet service provider Yahoo had over 3 billion user accounts impacted in what is possibly the biggest data breach in history. Yahoo believed the attack was the work of a "state-sponsored actor" resulting in the names, addresses, dates of birth, and phone numbers of over 500 million account holders being compromised. Then again in 2013, Yahoo disclosed that another breach by a different group of hackers compromised the personal details of over 1 billion account holders – this time passwords were also accessed. In 2017 Yahoo re-assessed the impact of this attack and increased their estimate from 1 billion users being impacted to 3 billion users. Yahoo's reputation took a serious hit from this revelation, with an estimated $350 million USDs being wiped off the company's share value.

Even with breaches such as the one impacting Yahoo, organizations still continue to fall foul of hacking. As recently as 2018 the hotel chain Marriott International announced that it had been the victim of a security breach. Hackers had managed to access and steal about 500 million customer data records – including credit card details. What's more, the attack had not been a "one off" attack, but had started back in 2014, and largely gone undetected for four years. Once again, the blame was put on a foreign power looking to gather data on US citizens. However, irrespective of who is collecting the data and orchestrating the attacks, customer data are being compromised.

The list of organizations being attacked goes on, and each year the list just keeps getting longer – and it's not just large corporations being attacked. In January 2019 the online retailer DiscountMugs.com announced that it had discovered malicious software designed to skim credit card details from online transactions. The software allowed the hackers to skim all the customers' card details.

In this online world in which we now live, it is safe to assume that at least some of your personal identifiable information, and that of your customers has been compromised in a breach of some sort.

11.2.1 Understanding the Vulnerability of your System

Without doubt, advances in technology have certainly made it a lot easier to connect to technology, and use it to support how we do business. With a blurring of the line between how we use our personal technology alongside our business technologies it has become more challenging to secure and control access to commercially sensitive aspects of our organizations. Who is accessing our systems, are they authorised to do so, and are they using tested and approved technologies to do so? These are important and relevant questions, the answers to which are changing on a daily basis. So how do we make sense of this potential problem? Without doubt, having individuals working for you who understand the complexities of data security is vitally important. However, every member of the organization, especially senior management and key decision-makers, should have a mental picture of where possible threats can manifest.

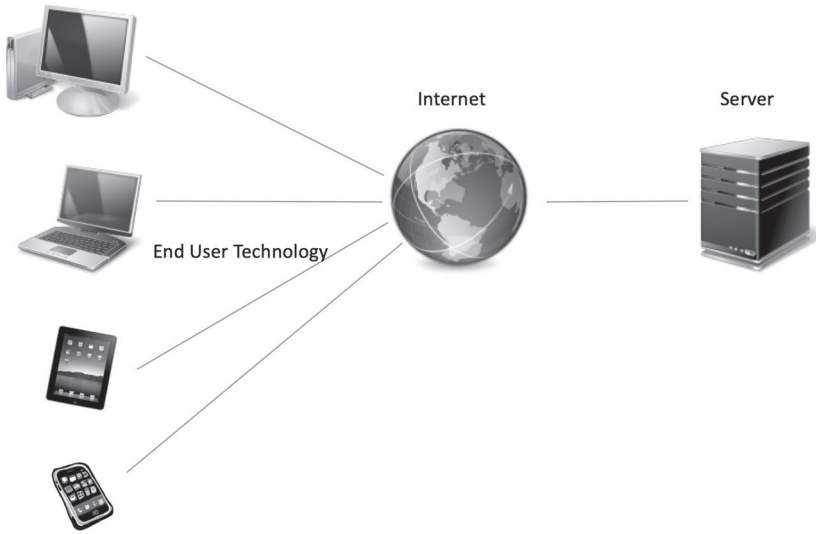

Figure 11.1: The Digital Environment

In our continuously connected world, our personal and work devices are connected to the internet almost all of the time. The diagram in Figure 11.1 simplifies this relationship. Using our "end-user" technologies we continuously access the internet in order to connect with servers that provide us with access to our work, online shops, social media, games, news, etc. However, this level of access also opens up our devices to scrutiny from others searching the internet for personal or proprietary information. The only way to be absolutely sure no one is accessing our data is if we disconnect and isolate our devices from all networked devices, and limit and control physical access. As you could imagine this would also negate the benefits of being able to access information and computing power from anywhere that has access to the internet. This is just not really practical for most people or organizations – simply consider how useful you would find your own computer if it had no internet/network connections? The reality is we need to provide some method of securely connecting our devices to the internet. However, the internet is a virtual door, that when opened allows access both ways. This can be problematic when we don't know who's standing on the other side of the door.

As we increase access to the internet for the purpose of commerce a number of things happen:

- We increase the amount of personal and financial data about us on the internet.
- We increase the value of our personal data to hackers of commercial entities.
- We increase the financial reward for those attempting to compromise our personal data.

These factors start to make hacking not just a means of testing one's programming skills but also a potentially lucrative career option for the less ethically minded. We can look at the problem of internet security from three linked perspectives:

- How can we secure the server connected to the internet, and the data on it?
- How can we secure the data that travel via the internet between the server and the end user's technology?
- How can we secure the end user's technology?

These three questions encapsulate the main challenges in securing your information and data.

11.2.2 Securing the Connection to the Internet

In order to help reduce the threat of unwanted attention, most organizations use a dedicated server, sometimes referred to as a web server to act as an intermediary between their internal IT infrastructure and the internet. Figure 11.2 provides a basic outline.

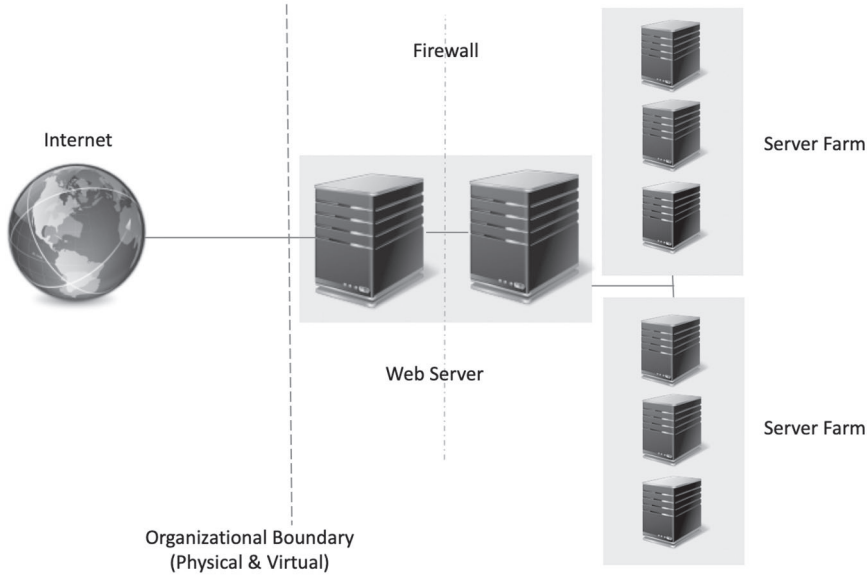

Figure 11.2: Basic Internet Connection

The web server – there may be many within any organization – is designed to provide a gateway between the organization's internal IT systems and the internet. The web server acts to control access to information both internal and external to the organizational boundary (Figure 11.2). This is an important function as the web server is tasked with safeguarding any sensitive information that is received or collected. To help with access control, the web server will have a virtual **firewall** (also referred to as a **network firewall**) installed on the server. The firewall is a dedicated security application that monitors and controls incoming and outgoing information and data flows. The firewall uses protocols and procedures defined as part of the security management system (section 11.3) to establish appropriate access rights between trusted internal networks and trusted and untrusted external networks.

The firewall is a critical system in ensuring the security of the organization's IT systems. A failure at the firewall can result in an unauthorised hacker gaining access to just about any system internally networked. Therefore, restricting the number of ways any server hosting the organization's firewall can be accessed must be a priority. This can be achieved in two stages:

1. **Securing physical access to the sever:**
    a. Ensure the server is access controlled and access is restricted to the absolute minimum number of personnel.
    b. Ensure the physical location of the server is separate from that of the internal networked servers.
    c. Ensure the server has a physical backup and there is redundancy to support continued operation should something happen to the main web server.

2. **Securing remote/online access:**
    a. Ensure logon access is limited to the absolute minimum number of employees.
    b. Ensure the web server is only tasked to monitor and control internet access. The server should not be used for other applications such as email, CRM, order management, etc.
    c. Ensure access to the server is through secure means such as secure ID or encrypted access.

Successful external attacks will be less likely by deploying an effective firewall protocol. However, that doesn't mean your systems are no longer under threat. It simply means other ways will be sought to gain access to your information and data. This is why it is so vital to secure physical access and remote access to the sever. Whoever controls the web server controls access to the organization's information and data.

11.2.3 Securing Information and Data flow

Information and data flowing between the web server and the end user's technology are at risk of being intercepted. It really doesn't matter whether you are scanning your email at home, at a hotel or coffee shop, information can be pulled from unsecured networks, such as unsecured public wi-fi networks.

Wi-fi in itself is a good method for accessing networked devices via the internet. What makes this type of access problematic is that once connected to a public or unsecured wi-fi access point the uploaded information is not encrypted. For a wi-fi hotspot to be considered secure, it must require the

user to log in using a password that conforms to the **Wi-Fi Protected Access** standards (WPA or WPA2) for security codes.

For some organizations and businesses, it may seem like a good idea to provide wi-fi open access. After all, there may be a high volume of customers passing through who are looking for access, such as at airports, railway stations, or coffee shops. In these instances, it may seem less time consuming to simply provide everyone with open access as and when they need it. However, this raises security issues for both the customer and the provider of the free access.

Issues for the customer:

Spoofing: Logging onto unsecured wi-fi can allow hackers to eavesdrop on your connection and gather useful information about your online activities. This could include how and when you log on to websites, which could include online banking, shopping, work emails, etc.

Infection: Being connected to an unsecure network can allow not only eavesdropping, but also the distribution of malicious software such as malware, viruses and ransomware. These may be downloaded to the user's computer through fake websites.

Issues for the wi-fi provider:

Stealing bandwidth: Unsecured wi-fi networks can be "piggy-backed" by hackers for their own purposes. Also, the network can be deliberately slowed due to a virtual logon request, thus effectively creating a denial of service (DoS) attack.

Illegal Use: By providing an unsecured network a user may use the bandwidth to engage in illegal activities, which in turn could have illegal implications for the wi-fi host. This is a potential problem for the wi-fi host as they may be legally responsible for how their network is used, and, therefore, could face significant consequences if the activities of the users come to light.

Some of the key steps to ensuring a safer experience when accessing wi-fi networks from outside the organization's firewall are as follows:

Ensure Secure Logon: When looking to access a wi-fi hotspot it is important to establish if the wi-fi is secure or not. If there is no secure logon (WPA/WPA2) required then the wi-fi is not safe.

Use secure URL settings: When accessing websites ensure the browser preferences are set up to only access websites that use SSL (Secure Sockets Layer) or TLS (Transport Layer Security) transmission protocols. These protocols will ensure a higher level of authentication and security when accessing these sites.

Virtual Private Networks (VPNs): This is possibly the strongest level of security you can use when accessing the internet via a wi-fi hotspot. The VPN provides a strong level of encryption on all the data moving to and from your device. Therefore, if the data are intercepted the high level of encryption will make it extremely difficult for the hacker to decrypt.

This leaves the last key area for potential attack or abuse. This is how end-user devices can be secured.

11.2.4 Securing the End user's Device

This is an important aspect of security as once information and data move from the organization's web server, via the internet, to the end user it is very difficult to control what happens to it from there. Because of the difficulties in accessing the web server, or capturing information as it travels between the web server and the end user, many security attacks focus on the end user's computer or network device. These could manifest as either digital (viruses, malware, ransomware, phishing, remote logon, etc.) or physical (a device is stolen or lost, unauthorised download of data to a USB device, unauthorised logon, etc.) breaches. As the perceived value of the information stored on a system increases, the risk of attack also increases. Because of this, individuals may be specifically targeted for the work they do, or the role they have in an organization, or individuals may just be randomly targeted in the hope of getting access to sensitive information. Whichever approach is used, organizations can help to ensure they limit the impact of a device falling into the wrong hands by implementing some basic security practices. Examples of these practices are as follows:

Anti-virus software: Ensure all devices connecting to the network use anti-virus software. This will help to reduce the potential for downloading potentially damaging viruses.

Manage the device settings: Centrally set up procedures to ensure systems attached to the network are receiving the necessary and mandatory software updates. Having devices connected that are not up-to-date in terms of their software versions may provide hackers with a potential weakness in the system.

Device network search: Make sure the "discover networks" function on your device is switched off. This function is designed to allow you to find printers and other computers/devices near you. However, this function also allows hackers on the network to find your device.

Personal firewall: Firewall software is not just for web servers. There are many vendors providing firewall software for personal computers. These firewalls, often referred to as **host-based firewalls**, provide the same functionality as those designed to protect web servers, and provide a vital function in also protecting information and data on personal computer devices.

Encrypted hard drives: This is where the hard drive in a computer or laptop is encrypted and can only be accessed once unlocked with a suitable password. This helps to ensure that the information on a hard drive will remain secure if the computer or laptop is lost or stolen.

VPN internet access: Ensure all requests for access, via the internet, to the organization's systems are conducted through a VPN or virtual private network. This will make sure all communication via the VPN is secure through encryption.

Limit connectivity: Many organizations disable USB ports and CD drives. This helps to physically limit the way information and data can be uploaded or downloaded from the device.

Establish an internet usage policy: This is designed to inform users of the risks associated with internet access, and also how they are expected to connect, interact, and behave whilst connected. The policy will also highlight the penalties for failure to comply with the usage policy.

As we can see, there is a level of complexity that needs to be managed. The potential for multiple devices to be connected to a network is almost limitless, and managing how a device or network is accessed needs to be proactively done. Therefore, it is important that any organization that is serious about maintaining the security and integrity of its systems and data, develops policy and procedures focused on information security.

11.2.5 Digitally Protecting your Data

It is not practical to disconnect devices from the internet and then still expect them to be able to communicate. We still need to be able to send messages in a secure manner. This is where cryptography comes in. **Cryptography** is simply the art and science of keeping information secure by actually changing the format of the information. This is not a new concept. In fact, there are examples from ancient Greek and Roman times when messages had their letters rearranged in order to hide their meaning. Another closely related concept is called **Steganography**. This is the art and science of writing hidden messages in a way that only the sender and receiver are aware the message has been sent. The earliest recorded example can be traced back to 440 BCE when Herodotus wrote about a slave who had a message tattooed onto his scalp. The slave's hair was allowed to grow back in order to keep the message secret. The purpose of the message was to incite a revolt against the Persians when the time was right. In modern times applying steganographic techniques is still commonly done. As with digital images the bits and bytes that represent words can be easily hidden in the bits and bytes that represent pictures. Therefore, documents can easily be hidden in digital images.

In essence, the difference between cryptography and steganography is:

Steganography involves hiding information whilst cryptography actually changes the information through encryption and decryption of the information.

This introduces two important aspects of the cryptographic process: **encryption** and **decryption**. Encryption is when you take a legible message, referred to as "**plaintext**" and apply some process to disguise the message. The encryption process results in the creation of "**ciphertext**". In order to make sense of the ciphertext the text is passed through a decryption process.

This process then results in turning the ciphertext back into the original plaintext.

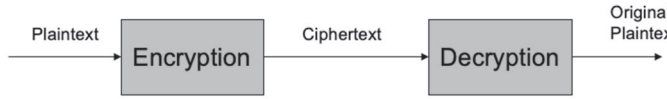

Figure 11.3: Encryption and Decryption

As information can be expressed digitally the methods used for encrypting and decrypting are based on mathematical algorithms, usually referred to as ciphers. The problem with this type of encryption is that the same cipher is used for encrypting and decrypting, and if a hacker gains access to the cipher they can decrypt any ciphertext they intercept. The way around this problem is to use a set of unique "keys" that effectively allows us to lock and unlock the text. The individual who is encrypting plaintext will have a unique key (Key "A"). This key is combined with the plaintext to create the ciphertext. When the ciphertext is then received by the proper recipient, they process the ciphertext through the algorithm with the addition of their personal key (Key "B").

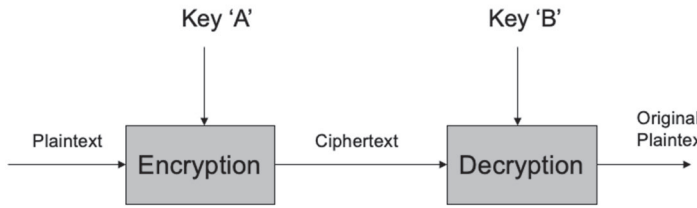

Figure 11.4: Key Encryption

This approach to encryption falls into two distinct formats. The first is where both keys (A and B) are either the same, or can be calculated from each other. This format is referred to as using **Symmetric-key Algorithms**. A user can encrypt and decrypt messages by gaining access to the encryption key. This type of algorithm is used in cash machine (ATM) encryption, securing email privacy, and remote secure access (wi-fi logons).

The second format is the **Asymmetric-key Algorithm** or **Public Key Infrastructure (PKI)** encryption. This relies on the fact that both keys are uniquely different. The encryption key can be made public so anyone can create ciphertexts using the key (Key "A" in Fig 11.4). However, only the person holding the decryption key (Key "B") can decrypt the ciphertext. This is a much more robust form of encryption used where digital signatures are required such as with SSL, TLS, access to VPNs, and Bitcoin.

With PKI, users get two keys which usually take the form of an alpha-numeric code. One key is designated as being "public", which is the key the user will openly share with anyone looking to securely communicate with them. Once a message is encrypted it doesn't matter who has access to the ciphertext, only the person with the private key can decrypt the message. Even having access to the public key will not work to decrypt a ciphertext once encrypted. The use of a two-key system means that the algorithm at the heart of the cryptographic process can be openly shared as knowledge of how the algorithm works will not provide a universal key for all ciphertexts. As you can imagine, the need for powerful computing is required if you are intending to use PKI to support real-time communication over the internet. The need to encrypt then decrypt data in real time back and forth between multiple individuals requires a lot of computing power. Because of this, being able to encrypt/decrypt data has, traditionally, been confined largely to specific activities within the military, government, and large corporations.

However, since the turn of the 21st century personal computing power has been increasing exponentially. People have more computing power in their smart watches now than NASA had when putting the first man on the moon back in 1969. As such, many applications designed to run on personal computers, laptops and mobile devices can now support different forms of data encryption. Many of the cryptographic algorithms in use today are commercially available for both business and personal applications. Some examples include:

- **Advanced Encryption Standard (AES):** This is a symmetric-key algorithm that has been adopted by the US National Institute of Standards and Technology (NIST). This standard replaced the **Data Encryption Standard (DES)** which was created in 1977, having a limited key length of 56 bits. This meant that more powerful computers could, given time, crack the key. The AES can use keys up to 256 bits

in length. This makes the encryption secure and as such it has been adopted as the US Government's standard for encryption software.

- **Blowfish:** This is another symmetric-key encryption algorithm. Once again this was designed as a replacement for the DES. Blowfish specifically addresses the issue of the weak key length that the DES suffers from. With Blowfish the key length is potentially significantly larger than the AES key length, with a maximum of 448 bits being acceptable.

- **GOST:** This symmetric-key algorithm was developed by the Soviet and then Russian government. It provides an alternative to the AES, but only has a maximum key length of 256 bits. However, this is an "old" system in comparison to the AES and Blowfish.

- **RSA:** This asymmetric-key (public key) algorithm was named after the three inventors: Rivest, Shamir and Adleman. It is a relatively slow, but secure, algorithm with a potential key length between 1,024 and 4,096 bits. This is too slow for real-time transactions or communications, but RSA has proved to be very useful in sharing keys for symmetric-key algorithm-based systems.

Encryption algorithms determine the level of security through the length of their keys. As computers have become more powerful cracking the key has become more of an option for hackers. When the DES originally came out in 1977 it had a key length of 56 bits. Back in 1977 a 56-bit key would have 72,056,594,037,927,936 combinations. If you tried one combination every second it would take 2.2 billion years to work through all the combinations! If somebody wanted to crack the key, they would need to work through all the combinations in order to find the right one. Very few computers at the time could do this and as such this key length was deemed secure enough for encrypting top secret material. However, time moves on and computers became more powerful. Now a 56-bit key would not be considered that secure, especially for secret and top-secret material. Most encryption software now offers key lengths of 256 bits, which is sufficient for now. However, given time, even keys this long will become susceptible to **Brute-force attacks**. A brute-force attack is a sustained digital attempt to work through every combination and test for access. Attacks are usually made by powerful computers designed for this type of criminal activity.

Time Out

Think about it: Just how secure is our system?

HomeSynth Ltd. started out 25 years ago as a hobby of Dirk Fulsum. Dirk is an electronics engineer with an interest in electronic music and electronic synthesisers. Dirk started to design and build synthesiser modules to meet a growing demand amongst electronic music enthusiasts who could or would not pay the high prices being demanded by established market leaders such as Moog, Yamaha, and Roland. At first, Dirk custom-built synths for local artists and electronic music aficionados, but word spread about the high quality of his work and the reasonable prices he charged. Very quickly Dirk's hobby turned into a business which now employs 35 people and has customers all over the world.

About 10 years ago Dirk and his management team (Sally Ross – Operations Manager, Jurgen Peters – Manufacturing, and Donal Hughes – Sales and Marketing) realised that the balance was shifting more and more towards online sales and they invested significantly in building an online commerce engine for their website. The company has moved away from custom-built synths to providing ready built and build-it-yourself kits – and business is booming.

Dirk spends most of his days working on new ideas for synth modules, and running a number of user groups to ensure the company continues to work on the projects that really matter to their loyal customer base. However, last week Rolly Dent, who looks after the company's IT, attended a security event focused on improving data security. Rolly was concerned about some of the issues raised at the event and thinks the company should seriously consider their current practices. Rolly goes to her boss, who is Sally Ross, to discuss some of the concerns she has. In particular, Rolly is concerned that the web server they use, as the company's gateway to the internet, also hosts all the company's emails, and web pages for the main site, and the e-commerce engine for processing online orders. Rolly is concerned that this is a potential security weakness and should be raised with the management team. Sally, however, is not so sure. After all, the system has been working fine for the last number of years without a problem. Also, the web server has a top-of-the-range firewall, which is remotely maintained by a third-party vendor who ensures the software is

always running the latest version. Rolly knows that Sally is not wrong but still can't help thinking that the system is vulnerable; however, she can't disagree with anything Sally says.

A week later Rolly is sitting at her desk when Dirk pops by to pick up some electronic components that he needs to complete a prototype he's working on. Dirk asks Rolly what's on her mind. Rolly tells Dirk about the security conference she attended and gives him a broad outline of some of the key take-away points concerning system security. Dirk thanks Rolly for the parts and heads back to his workshop. On his way back he can't help thinking about what Rolly has told him about the conference, and it stops him in his tracks. As managing director of the company Dirk is aware of how the IT system is configured and managed, but has left this very much to Sally Ross and her team – after all there's never been a problem. However, over 90% of all sales and revenue goes through the website. What would happen to the business if access to the website was shut down? What would this mean in terms of money and reputation?

Dirk pops by his office and sends out an email to the management team. The email is titled "Securing our online business". Dirk want to make this the top item for the next management meeting. Something tells him this is something they need to tackle right away – he's just not too sure how…

Questions:

- Who currently has access to the web server? And is it a good idea to provide remote access to this system?
- Considering the main conduit for business is the internet, is the company giving the management of their IT the required level of focus? How could they improve the level of awareness that IT and data security are given at an operational and strategic level?
- Does Sally have a point about the system being secure? After all, there have been no problems with access to the website or payment methods so far.
- What would you consider as being the most important next steps in securing the company's IT systems?

11.3 Information Security Frameworks

As we can see there's a lot to consider when looking at information security. Over recent years organizations have developed approaches that work for them. These approaches have been codified into a set of agreed policies, procedures, processes, and documents which, in turn, form frameworks. The organic way in which many of these frameworks have developed has resulted in over 250 frameworks relating to information security being used worldwide. Many of the frameworks share similar structures as they have been developed out of a shared requirement for better security and control of information and data assets. Many of these frameworks have also been developed through industry-based cooperation, and when employed within an organization the actual frameworks will usually be subject to some form of customisation in order to fit with the organization's work practices.

Four of the most common information security frameworks are:

- International Standards Organization/International Electrotechnical Commission **(ISO/IEC) 27000**
- Control Objectives for Information and Related Technology **(CoBIT)**
- Federal Information Processing Standards **(FIPS)**
- US National Institute of Standards and Technology **(NIST)**

All four of these frameworks are designed to ensure appropriate control mechanisms are identified and in place in order to assure the security of information and data across an organization. They have been developed to support the requirements of any large enterprise organization, but they can be customised for the needs of small and medium enterprises as well. The frameworks are designed to cover an extensive range of topics, with the organization looking to adopt the framework being able to select and focus on those topics that relate to its own information security needs. As with the growing influence of technology on just about all aspects of business and personal life, the frameworks also continue to grow and change to reflect the changing requirements for information security. For example, the ISO/IEC 27000 framework now contains more than 12 standards to support the growing challenges around technology use.

11.3.1 Basic Structure of a Security Framework

As stated, frameworks will vary in format and approach, however, their overall intent is the same: information security and control. As such the selection of frameworks may well be down to a simple selection based on the personal choice of the chief information officer (CIO). That said, the effectiveness of the chosen framework is dependent not on the name, but on how thoroughly and conscientiously it is implemented. As such most organizations will have a number of security controls in place relating to the handling of their information and data assets. However, to be effective, these controls will need to be part of some form of information management system. All security frameworks will provide guidance on what the management system should focus on, and how it should be structured. Take for example the **ISO/IEC 27001** standard, which is part of the ISO/IEC 27000 family of standards. ISO/IEC 27001 is specifically focused on defining what's required for the development of an information security management system (**ISMS**). Fundamentally, the framework should:

- Identify where an organization is at risk of intentional and unintentional security breaches.
- Identify the appropriate **controls** that need to be in place to provide the necessary mechanisms to mitigate for all such risks.
- Provide security policies and plans to help the organization to continue to operate should a breach happen.

These are the basic functions one should expect from any information security framework. When identifying risk, this can be covered through the use of a risk register as discussed previously. When it comes to controls, each framework will identify a set of controls that will cover the activities that span the organization and cover everything from physical access to legal/regulatory requirements for data handling. For example, ISO/IEC 27001 currently lists 114 controls that are grouped into 14 different groups. These groups are as follows:

- Information security policies.
- How information security is organised.
- Human resources security – controls that are applied before, during, or after employment.
- Asset management.
- Access controls and managing user access.

- Cryptographic technology.
- Physical security of the organization's sites and equipment.
- Operational security.
- Secure communications and data transfer.
- Secure acquisition, development, and support of information systems.
- Security for suppliers and third parties.
- Incident management.
- Business continuity/disaster recovery (to the extent that it affects information security).
- Compliance – with internal requirements, such as policies, and with external requirements, such as laws.

Each of these groups will form a control group, which in turn will be monitored and managed as part of the management system. How these control groups are effectively managed will be determined by the procedures and policies developed as part of the information security management system.

11.3.2 Developing Effective Policies and Procedures

Now that the organization has identified the potential risks to its information and data assets, it must put in place the necessary policies and procedures to ensure the ongoing integrity of the information systems. However, before we take a closer look at policies and procedures it is important that we share an understanding of what these terms mean.

> **Policy:** This is a statement of an organization's values, objectives, and intent concerning a specific area or topic. The policy is implemented through the use of defined procedures.
>
> **Procedure:** This defines how to implement one or more activities of a business process. It defines the sequence of steps and specifies for each step what needs to be done, when, and by whom (ISO 9001).

As you can see, policies are used to define the acceptable behaviours and levels of acceptable risk concerning certain areas of the organization.

Compliance with policies should be mandatory. As part of the overall framework and security management system, a **Security Policy** needs to be developed so that everyone working within the organization will understand the organization's stance on information and data security, and also the reporting mechanisms and potential repercussions should the security be compromised. As a minimum, security policies should contain information on the following:

- The organization's security goals and identified mechanisms for achieving the goals.
- The organization's most important information/data assets.
- The individual responsible for the information/data assets.
- How the organization will manage information/data security.
- The ranked information risks facing the organization.
- The legal and regulatory obligations that the policy adheres to.
- A definition of the mechanism for dealing with breaches to policy and suspected assurance weaknesses.
- Identification of additional policies that support or are related to the security policy.
- The owner of the policy who is responsible for ensuring its relevance.
- A statement of support from senior management/board level.

The statement structure and format will vary from organization to organization. However, these components should be present as a minimum. Because of the importance that policies have within the overarching management and governance framework of an organization, policies should always be endorsed by senior management and have an identified owner from within the senior management team.

Procedures are more descriptive in nature, and define in detail what needs to be done in order to assure compliance with the relevant policy or policies. Procedures will also provide a clear direction as to when, how often, and by whom certain tasks need to be completed. Escalation paths and reporting lines will also be clearly laid out in order to quickly raise any security issues or problems.

11.3.3 Recovering from a Security Breach

Unfortunately, we can never remove the possibility or risk of something happening. Sooner or later a breach in security will happen, which in turn may result in the partial or total loss of operational capability. This may be down to an intentional cyber-attack or a fire in one of the main administrative buildings. Whatever the situation, the organization must strive to get back to some level of operational capability as soon as possible. This is where **Disaster Recovery Planning** becomes important, and forms a key part of any information security management system (ISMS).

As part of the ISMS, the disaster recovery plan (DRP) should outline plans for the restoration of disrupted information, communication and technology services. The plan should outline procedures for getting critical and backup systems online, who needs to be involved, the expected timeframes for bringing systems back online, and alternative systems and arrangements to be implemented whilst the compromised systems are repaired. The DRP will also help to identify the additional resources required to ensure that the organization remains operational and its information and data are secure should disaster strike.

For example, many organizations will now look at cloud storage as a means of securely backing up their critical data. Should something happen to the organization's own servers then data can be accessed via a cloud-based solution. How thorough and extensive the DRP is will depend on the value the organization puts on its information/data, and how quickly it needs to regain full operational status. If you consider any of the main international banks, they will have back-up server farms all over the world to minimise the risk of losing access. Back-up locations will also be available for people to work from spare computers and other communication devices.

Unfortunately, not all DRPs succeed as hoped. In 2012 the Ulster Bank, a commercial bank operating across Ireland, suffered a significant IT failure. This resulted in 600,000 customers being without access to essential and basic banking services for 28 days. The Central Bank of Ireland conducted an investigation and found the Ulster Bank to have serious failings in its "governance arrangements" in relation to its IT systems. The Ulster Bank was fined 3.5 million euros, and ordered to pay 59 million euros in compensation to affected customers. Whilst these sums are not that big when you consider the profits that commercial banks are capable of making, the damage to the Ulster Bank's reputation was not insignificant. One of the

factors raised as contributing to the IT failure's delay in getting the systems back online, was the outsourcing of certain IT functions within the bank. The Central Bank said that while it recognised that IT outsourcing is a feature of modern banking, it is no defence for regulatory failings.

11.3.4 Legal Implications and Considerations

Up to now we've looked at the different types of security breach and how to develop a system to help minimise the level of impact associated with experiencing such risks. Information security frameworks are important as they help to establish a level of focus that is necessary for the secure handling of information and data assets. The framework will drive the need for a security policy and subsequent procedures to ensure identified risks are managed accordingly. Organizations adopting any of the framework models discussed in this chapter, can also seek a level of certification from the framework's owning organization. This certification provides a third-party level of recognition for the standards being obtained by an organization. This can be important in helping to ensure customers and partners of the resilience and security of the organization's IT systems.

However, one important aspect of information and data management still needs to be considered. When information or data that contain personal details are collected, who determines when and how these personal details can be used? Personal information has become a very valuable commodity and there are many high-profile examples of why there needs to be some control over how this information is shared and used. In 1995 the European Commission introduced the **Data Protection Directive** (Directive 95/46/EC). The purpose of the directive was the protection of individuals with regard to the processing and sharing of their personal data.

Personal data – *any information relating to an identified or identifiable natural person ("data subject"); an identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity.* (Data Protection Directive 95/46/EC art. 2a)

The notion of a data protection directive is ingrained in the concept of a **right to privacy**, which in turn is a key component of the European Union's laws concerning human rights. When the Data Protection Directive came

into force it affected all data processing activities across the EU. Any data being processed outside the EU, but being shared or collected within the EU would still be subject to the directive. The directive was focused on three simple principles:

- **Transparency:** A data subject has the right to be informed when their personal data is being processed.
- **Legitimate purpose:** Personal data can only be processed for specified explicit and legitimate purposes and may not be processed further in a way that is incompatible with those purposes.
- **Proportionality:** Personal data may be processed only insofar as they are adequate, relevant and not excessive in relation to the purposes for which they are collected and/or further processed.

In essence, the Data Protection Directive meant that personal information could not be used for any other purpose other than the one explicitly agreed to by the data subject. This directive was then replaced in 2016 by regulation 2016/679/EU, which is known as the **General Data Protection Regulation,** or the **GDPR**. A significant difference between the Data Protection Directive and the GDPR is that one is a directive while the other is a regulation, and from a European Union perspective the difference between the two is as follows:

- **An EU Directive:** A directive is a legal act of the European Union, which requires member states to achieve a particular result without dictating the means of achieving that result.
- **An EU Regulation:** A regulation is a legal act of the European Union that becomes immediately enforceable as law in all member states simultaneously.

As the GDPR is a legally enforceable requirement for all entities involved in the collecting, handling, processing, and sharing of personal data, fines for breaches in the regulation can be substantial with penalties of up to 20 million euros or 4% of an organization's annual worldwide turnover. In 2019 the European Commission brought the Spanish and Greek Governments to the European Court of Justice over a failure to implement the GDPR. The commission stated that:

"The lack of transposition by Spain and Greece creates a different level of protection of peoples' rights and freedoms and hampers data exchanges

between Greece and Spain on one side and other Member States who transposed the Directive on the other side*".*

The resolve of the European Commission is clear, and the message is that contravention or failure to implement the regulation will be met with legal action.

Whilst other countries and economic regions such as the US, India, and Australia strive to create regulations that protect their citizens and their personal information, there are, as yet, no similar pieces of legislation to match the GDPR. That said, the EU has determined that some countries such as the US, Canada, Japan and New Zealand have adequate levels of data protection. However, the GDPR is not the only EU initiative designed to safeguard personal information.

- **EU-US Privacy Shield:** In 2016 the European Court of Justice declared the International Safe Harbour Privacy Principle invalid, and in 2016 a new agreement was reached between the EU and the US. This agreement resulted in the EU-US Privacy Shield which is designed to regulate the exchange of personal data for commercial use between the US and the EU.
- **NIS Directive:** The Network and Information Systems (NIS) directive came into existence in 2016. The purpose of this directive is to ensure that all EU member states create a strategy for dealing with the growing threat of cyber-security breaches.

Whilst the GDPR is not the only piece of legislation concerned with private data and the rights of any individual to whom these data relate, it is currently the most comprehensive in its scope and nature. One thing for sure is that whilst other nations may not have similar all-encompassing regulatory frameworks there is a growing demand from individuals and regulatory bodies alike for data privacy in line with that offered by the GDPR.

Time Out

Think about it: When does the data become our data?

Jorge Lindquist runs a very successful cosmetics company based in Paris, France. For the last five years Jorge's company, Oki-Oki, has been trying to break into the US market. However, competition has prevented Oki-Oki from gaining any significant market share in a highly competitive market. However, Julia Sward, who is responsible for building a business in the US for Oki-Oki thinks she may have a solution to breaking the deadlock they are currently experiencing. Ryland, a medium player in the US cosmetics industry is in financial trouble. A couple of risky market strategies didn't pay off in the way they were planned which has resulted in Ryland experiencing severe cash-flow problems.

Julia believes this could be the exact opportunity that Oki-Oki and the senior management team are looking for. Julia presents her idea to the senior management team at the Monday morning management team meeting. Everyone seems positive about the plan, especially when Julia suggests they make an offer to take over Ryland as word has gotten out about their financial predicament, and they are currently experiencing a sharp fall in the company's share price. Ryland, Julia believes, is ripe for take over. Julia points out that whilst the product ranges are not that compatible, and some work would need to be done to bring both ranges into line, the main, and overriding benefit of the take-over would be access to Ryland's existing customer database. You see, Ryland does about 80-90% of its sales via the internet, and as such has amassed a substantial customer database.

Jorge and the majority of the management team think this is a "no-brainer" and that they should start the process to acquire Ryland immediately. Having access to Ryland's customer database will provide Oki-Oki with just the boost it needs to upsell their products to the Ryland customer base.

However, Diane Shaw, Oki-Oki's Chief Information Officer, has some concerns. Whilst Diane doesn't want to stop the planned take-over bid, she feels they should be cautious. The management team aren't sure what Diane is concerned about; surely this is an excellent opportunity? Julia believes Diane is just being awkward and needs to get behind the rest of

the management team on this bid. However, Diane has recently been focused on getting Oki-Oki GDPR-compliant and thinks there may be issues around using customer data to sell product to customers who have not up to this moment expressed a desire to buy Oki-Oki products. Julia gasps in frustration that this is not a problem as these customers are not within the EU!

Questions:

- Do you think Diane is right to be concerned about Oki-Oki using a US customer database to sell Oki-Oki products?
- Surely, if Oki-Oki takes over Ryland then all of Ryland's assets and resources become the property of Oki-Oki? If this were the case, then why would using Ryland's customer database be problematic, as Diane suspects it will?
- If Oki-Oki is found to be in violation of the GDPR, what possible legal penalties could it face, and what other negative repercussions could also result?

11.4. Learning Summary

As we now exist within a knowledge economy, information and data have arguably become the most important asset that any organization can possess. Some would say that "data is the new oil". Whether or not one thinks of this as an over-exaggeration, the point is that information and data present a significant value to the organization and to anyone with an interest in how this organization uses the information and data. When something increases in value it's because there is a growing demand – this is exactly the case for information and data. This introduces a challenge for organizations operating in a digitally connected world. How can they protect their information and data from being accessed and compromised by unauthorised agents?

The problems of securing information and data are further compounded by the manner in which we connect to the internet. We access public and private systems through our personal and work devices. This can be difficult

to manage for any organization, and as such can bring with it significant challenges. These challenges are further compounded by the rate of change and advancement of the technology. As such organizations need to be ever vigilant about potential breaches which in turn may compromise the integrity of the information and data held on their systems. As such breaches can be either **intentional** or **unintentional** in nature. Both types of breach can be further broken down between **physical** and **digital breaches**. Unintentional breaches are usually down to lack of awareness, concentration, or training, and although the results of such a breach can be very damaging to the organization in terms of revenue and/or reputation they can be mitigated for with good training and education. However, intentional breaches are proactive attacks on an organization to gain unauthorised access to damage, disrupt, or steal proprietary information or data.

Without doubt, increased internet connectivity increases the risk of an unauthorised systems breach. As such if an organization is connected to the internet senior management must make security and control a priority.

It is important to understand the motivations for launching an attack on an organization. Certainly, there are many reasons, some of which have become more apparent in recent years ranging from the advent of WikiLeaks and it endeavours to expose, what it believes to be, unethical and secret government activities, to hackers gaining access to customer card payment details for the purpose of selling on the data via the dark web. What is important to remember, is that even though a breach may be intentional or unintentional the outcome can be equally damaging in terms of revenue lost and reputations destroyed.

Being aware of the potential threats to an organization's information systems is an important step in the right direction, and so is being aware that any of these threats may manifest at any time. However, in order to mitigate for any of these threats the organization needs to be able to assess the risk to the organization should any potential threat be realised. As with all risks, you can never fully remove the chance that they may happen, but what you can do is mitigate for the risks in a way that will hopefully reduce the impact such a risk can have should it happen. As Colman (2011) believes "…the art of risk management is not just in responding to anticipated events but in building an organizational culture that can respond quickly to risks and withstand unanticipated events". In order to achieve this, an organization needs to establish a risk management capability that exists at all levels

throughout the organization. Once the risks have been identified and options (where possible) have been identified then ownership must be allocated to each risk. In this way individuals across the organization are identified and held accountable for ensuring risks are managed whenever possible. Progress is then tracked for each risk. A method for helping to identify and manage risks of all types is the implementation of a **Risk Register**.

However, no matter how well we identify, track, and mitigate risks associated with information and data security it is safe to assume that at least some of your personal identifiable information, and that of your customers, has been compromised in a breach of some sort. With a blurring of the line between how we use our personal technology alongside our business technologies it has become more challenging to secure and control access to commercially sensitive aspects of our organizations. Using our "end-user" technologies we continuously access the internet in order to connect with servers that provide us with access to our work, online shops, social media, games, news, etc. However, this level of access also opens up our devices to scrutiny from others searching the internet for personal or proprietary information. Therefore, we need to provide some method of securely connecting our devices to the internet. We can look at the problem of internet security from three linked perspectives:

- How can we secure the server connected to the internet, and the data on it?
- How can we secure the data that travel via the internet between the server and the end user's technology?
- How can we secure the end user's technology?

These three questions encapsulate the main challenges in securing your information and data. Looking at security across all three areas introduces a level of complexity that needs to be managed. The potential for multiple devices to be connected to a network is almost limitless, and managing how a device or network is accessed needs to be proactively done. Two methods for improving the security and integrity of information and data being shared via any form of digitally connected network are **Steganography** and **Cryptography**, the difference being that steganography involves hiding information whilst cryptography actually changes the information through its encryption and decryption. Both methods are used in widely available commercial applications to help organizations and end users to secure their information and data. However, encryption technologies are by far the most popular. Encryption applications come in two main formats: **Symmetric-**

key algorithms and **Asymmetric-key (or Public key) algorithms**. Both formats use digital keys to lock and unlock messages. The length of the key used will determine how secure the encrypted message will be to an attack such as a **Brute-force Attack**. This is where an attacker submits many numerical combinations or passwords with the hope of guessing correctly.

So, how do we ensure that the organization remains focused on the most probable threats, and has suitable plans in place to counter any potential attacks? This is where the development and implementation of an information security framework is important. As we can see, there's a lot to consider when looking at information security. Over recent years, organizations have developed approaches that work for them. These approaches have been codified into a set of agreed policies, procedures, processes, and documents which, in turn, form frameworks. Four of the most common information security frameworks are the **International Standards Organization/International Electrotechnical Commission (ISO/IEC) 27000**, the **Control Objectives for Information and Related Technology (CoBIT)**, the **Federal Information Processing Standards (FIPS)** and the **US National Institute of Standards and Technology (NIST)**. All four of these frameworks are designed to ensure that appropriate control mechanisms are identified and in place in order to assure the security of information and data across an organization. The frameworks are designed to cover an extensive range of topics with the organization looking to adopt the framework being able to select and focus on those topics that relate to its own information security needs. As with the growing influence of technology on just about all aspects of business and personal life, the frameworks also continue to grow and change to reflect the changing requirements for information security.

When considering a framework, the following aspects should be covered as a minimum:

- Identify where an organization is at risk of intentional and unintentional security breaches.
- Identify the appropriate **controls** that need to be in place to provide the necessary mechanisms to mitigate for all such risks.
- Provide security policies and plans to help the organization to continue to operate should a breach happen.

The framework will help to ensure that potential risks are identified and the necessary policies and procedures are put in place. **Policies** are used to

define the acceptable behaviours and levels of acceptable risk concerning certain areas of the organization. Compliance with policies should be mandatory. As part of the overall framework and security management system, a **Security Policy** needs to be developed so that everyone working within the organization will understand the organization's stance on information and data security, and also the reporting mechanisms and potential repercussions should the security be compromised. **Procedures** are more descriptive in nature, and define in detail what needs to be done in order to assure compliance with the relevant policy or policies. Procedures will also provide a clear direction as to when, how often, and by whom certain tasks need to be completed. Escalation paths and reporting lines will also be clearly defined in order to quickly raise any security issues or problems.

Unfortunately, we can never remove the possibility or risk of something happening. Sooner or later a breach in security will happen, which in turn may result in the partial or total loss of operational capability. This is where **Disaster Recovery Planning** (DRP) becomes important, and forms a key part of any **Information Security Management System** (ISMS). As part of the ISMS the DRP should outline plans for the restoration of disrupted information, communication and technology services. The plan should outline procedures for getting critical and backup systems online, who needs to be involved, the expected timeframes for bringing systems back online, and alternative systems and arrangements to be implemented whilst the compromised systems are repaired. The DRP will also help to identify the additional resources required to ensure that the organization remains operational and its information and data secure, should disaster strike.

However, one important aspect of information and data management still needs to be considered. When information or data that contain personal details are collected, who determines when and how these personal details can be used? Personal information has become a very valuable commodity and there are many high-profile examples of why there needs to be some control over how this information is shared and used. In 1995 the European Commission introduced the **Data Protection Directive** (Directive 95/46/EC). The purpose of the directive was the protection of individuals with regard to the processing and sharing of their personal data. The notion of a data protection directive is ingrained in the concept of a **right to privacy**, which in turn is a key component of the European Union's laws concerning human rights. When the Data Protection Directive came into force it affected all data processing activities across the EU. Any data being

processed outside the EU, but being shared or collected within the EU, would still be subject to the directive. This directive was replaced in 2016 by regulation 2016/679/EU, which is known as the **General Data Protection Regulation**, or the **GDPR**. A significant difference between the Data Protection Directive and the GDPR is that one is a directive while the other is a regulation, and from a European Union perspective, the difference between the two is as follows:

- **An EU Directive** – A directive is a legal act of the European Union, which requires member states to achieve a particular result without dictating the means of achieving that result.
- **An EU Regulation** – A regulation is a legal act of the European Union that becomes immediately enforceable as law in all member states simultaneously.

As the GDPR is a legally enforceable requirement for all entities involved in the collecting, handling, processing, and sharing of personal data, fines for breaches in the regulation can be substantial with penalties of up to 20 million euros or 4% of an organization's annual worldwide turnover. Whilst the GDPR is not the only piece of legislation concerned with private data and the rights of any individual to whom those data relate, it is currently the most comprehensive in its scope and nature. One thing is for sure, whilst other nations may not have similar all-encompassing regulatory frameworks there is a growing demand from individuals and regulatory bodies alike for data privacy in line with that offered by the GDPR.

11.5 Case Study: Data Breach at Heartland Payment Systems Inc.

Heartland Payment Systems Inc. was established in 1997 and operated out of Edmond, Oklahoma (US). The company was responsible for processing electronic payments for nearly 300,000 US-based businesses which translated to over 100 million transactions a month, and $80 billion USD a year. The company was good at what it did, and by 2014 could boast a revenue of over $2 billion USD annually. In 2016 Heartland Payment Systems was bought by Global Payments for $3.5 billion USD. Heartland now operates as a subsidiary of Global Payments.

On 20 January 2009, Heartland announced that it had been the victim of a security breach. The breach had directly impacted their processing systems, which resulted in customers' personal information and credit card details being hacked. This would allow the hackers to re-imprint the stolen information onto counterfeit credit cards. Once the scale of the breach was understood, Heartland estimated that approximately 100 million credit cards had been compromised, affecting more than 650 financial services organizations. Some would say that this is a conservative estimate and the numbers affected were much higher.

At the time of the breach Heartland was compliant with the Payment Card Industry Data Security Standards (PCI DSS). This is an information security standard designed to help organizations to securely handle credit cards, and keep secure the information contained on the cards. The standard was created to increase controls around cardholder data to reduce credit card fraud. Organizations seeking PCI DSS need to be assessed either annually or quarterly by an externally qualified security assessor.

When the breach happened, the hackers managed to access the payment system via an attack directed at the company's website. Heartland was quick to react to the attack, which had manifest itself as a malware attack. The IT people moved fast to isolate (or so they thought) the virus, and once done thought nothing further of the attack. However, around May 2008, and unknown to anyone in Heartland, the malware re-surfaced – this time in the main credit card payment system. This happened just two weeks after Heartland had completed a successful PCI DSS annual assessment. The malware program continued to work away undetected until late October 2008, when a credit card company raised concerns about some of the information they were getting back from Heartland as part of their monthly reports. Heartland responded quickly to the concerns raised and hired three separate forensic firms to investigate their IT systems. All three forensic firms gave the Heartland IT systems the all clear. Then in January 2009 Heartland employees found the malware program.

The Heartland management team decided to come clean straight away. Robert Carr (CEO) felt that, even though it would be painful for the company, the best option was to be open with their partners and shareholders. Carr wasn't wrong – the stock price fell nearly 80% in the days after the disclosure, and Visa and Mastercard both delisted Heartland,

meaning that none of their transactions would be processed by the company. However, maybe Carr's honest approach paid off as Visa reinstated Heartland as a payment processor in April 2009. Overall, the breach cost Heartland approximately $150 million USD, which is a lot of money for something it didn't do!

In 2012 Robert Carr identified the following lessons that he and his team had learned from the 2008 breach. Carr started by highlighting the fact that no organization should solely rely on its firewall to protect its systems. Putting all your faith in one point in the network is not a wise move. Organizations should also be more open and honest about their experiences with the types of cyber-attacks they experience. When the perpetrator of the attack was finally caught it transpired that he and his team had launched similar attacks on other well-known organizations (such as 7-Eleven). If more information had been shared, then overall awareness of how attacks were being instigated could have helped organizations to better protect themselves.

Also, something that slowed Heartland down was the fact it they didn't have a Disaster Recovery Plan. If it had had a DRP then Heartland would have been able to recover from the attack much sooner. However, you can be sure Heartland now has a DRP in place.

Carr also believes the malware was able to move around the organization's network because of human error. He does not believe there was any intentional desire to enable the malware, just that unintentional actions allowed the malware to propagate throughout the system.

By 2012 Heartland's stock price and market capitalisation had recovered to the levels they had been prior to the disclosure in 2009.

In 2010 an American computer hacker, Albert Gonzalez, was tried and convicted for his role in instigating the Heartland data breach. Gonzalez was sentenced to 20 years in prison.

Questions

1. The security and integrity of an organization's IT system are the sole responsibility of that organization. How do you think Heartland failed in this regard?
2. Carr recognises the fact that the failure to have an effective DRP in place slowed their recovery. What aspects of a DRP would have helped in this situation?
3. Carr identified the impact that unintentional actions can have in enabling a security breach. How do you think Heartland could proactively reduce the chances of unintentional actions in the future?
4. The malware was able to move from the website to the payment processing system. The usual practice for payment processing is that merchants would process their card payments through a credit card payment machine, and not through Heartland's website. Do you think keeping the website and processing systems separate would help to prevent this type of breach in the future?

11.6 Review Questions

True/False Questions

11.1 The latest technology will protect your information and data. T or F?

11.2 Only large organizations are at risk of a cyber-attack. T or F?

11.3 Any system directly or indirectly connected to the internet is at risk of attack. T or F?

11.4 Threats to information security can be either digital or physical in nature. T or F?

11.5 A breach can be caused through either intentional or unintentional actions. T or F?

11.6 An unintentional breach is seldom as damaging as an intentional breach. T or F?
11.7 Once a security breach has happened it will become obvious within a short period of time. T or F?

11.8 As long as an organization's servers are protected by a firewall the network will be safe from attack. T or F?

11.9 The biggest attractions for hackers are personal and customer information. T or F?

11.10 Sometimes an organization will be hacked because it is easy, or seen as a challenge to do so. T or F?

11.11 Risk management helps to remove the potential threat. T or F?

11.12 When identifying risks only focus on those risks you can do something about. T or F?

11.13 Managing information security risk should be part of the overall governance strategy. T or F?

11.14 According to Chaffey & White (2011), there are three key stages in the risk management process. T or F?

11.15 Using a risk matrix can help to prioritise risks against their potential impact and probability of risk. T or F?

11.16 An effective risk management process and capability will help to build confidence in the organization's ability to manage potential threats. T or F?

11.17 A risk register provides senior management with an up-to-date, holistic view of all identified risks potentially impacting the organization. T or F?

11.18 As long as a computer is not directly connected to the internet it is safe from attack. T or F?

11.19 Having a dedicated server that acts as a firewall between the internal network and the internet is vitally important for information security. T or F?

11.20 The firewall is a dedicated security application that monitors and controls incoming and outgoing information and data flows. T or F?

11.21 A failure at the firewall can result in an unauthorised hacker gaining access to just about any system that is internally networked. T or F?

11.22 All external attacks will be stopped by deploying an effective firewall protocol. T or F?

11.23 Public wi-fi networks provide a secure way of connecting to the internet. T or F?

11.24 An effective method of improving end-user security is establishing an internet usage policy. T or F?

11.25 Cryptography involves hiding information within digital pictures. T or F?

11.26 When text is encrypted it becomes ciphertext. T or F?

11.27 Two types of encryption algorithms are asymmetric-key and non-symmetric-key encryption. T or F?

11.28 Another name for asymmetric-key encryption is public key encryption. T or F?

11.29 The key length determines the level of security that the encryption algorithm provides. T or F?

11.30 CoBIT is a commonly used information security framework. T or F?

11.31 ISO/IEC 27001 is specifically focused on defining what's required for the development of an information security management system. T or F?

11.32 The Data Protection Directive means that personal information cannot be used for any other purpose other than the one explicitly agreed to by the data subject. T or F?

11.33 The GDPR is a guideline for countries in the EU on how to handle personal data. T or F?

Multiple Choice Questions

11.34 Which of the following is not a factor that supports the growth in information breaches?

A. Growth in connectivity
B. Improved computer literacy
C. Legal ambiguity
D. Rise in data value

11.35 Technology connectivity raises concerns for those trying to secure their networks. Which of the following is not really a concern?

A. The internet provides two-way access
B. Software applications can contain flaws
C. The internet is increasingly being used for financial transactions
D. The internet provides faster connectivity

11.36 According to Laudon & Laudon (2015) you must make what a priority when connecting to the internet?

A. Security and accountability
B. Control and security
C. Security and responsibility
D. Security and training

11.37 Which of the following is not considered a type of security breach?

A. Virus infection
B. Mis-placed laptop
C. Working from home
D. Password on a Post-it note

11.38 According to Chaffey & Chaffey (2011) there are four generic stages to the risk management process. Which is the odd one out?

A. Identify risk
B. Identify option
C. Implement
D. Move to the next risk

11.39 The risk register is important in managing risk. However, which one of the following is not a benefit of using a register?

A. It provides senior management with an up-to-date and holistic view of all identified risks potentially impacting the organization

B. The RR shows accountability – who is responsible for which risks
C. It identifies a potential gap and overlap areas for activities focused on risk mitigation
D. It improves morale amongst IT staff

11.40 We can look at the problem of internet security from three linked perspectives. Which of the following is not one of them?

A. How we secure servers to their rack mountings
B. How we secure servers and the data on them

C. How we secure data between the server and the end user via the internet
D. How we secure the end user's device

11.41 When accessing wi-fi, it is important to ensure the network connection is secure. Which of the following is not a legitimate method for securing a wi-fi network?

A. Ensure there is a secure password logon
B. Use a VPN
C. Only connect to websites that use SSL or TLS protocols
D. Connect from a quiet place

11.42 It is important to ensure that the personal device you are connecting from is secure. Which of the following is not a valid method of improving end-user security?

A. Install anti-virus software
B. Encrypt the device's hard drive
C. Install a personal firewall
D. Use the same password for all devices

11.43 ISO/IEC 27001 is specifically focused on defining what's required for the development of an information security management system (ISMS). Which of the following is not a core aspect of the framework?

A. Identify where an organization is at risk of intentional and unintentional security breaches
B. Identify the appropriate controls that need to be in place to provide the necessary mechanisms to mitigate for all such risks
C. Provide security policies and plans to help the organization to continue to operate should a breach happen
D. Highlight the levels of technology availability throughout the organization

11.44 A security policy needs to be developed so that everyone working within the organization will understand the organization's stance on information and data security, and also the reporting mechanisms and potential repercussions should the security be compromised. As a minimum, security policies should contain information on which of the following?

A. An overview of the organization's technology road maps for the foreseeable future
B. The organization's security goals, and identified mechanisms for achieving the goals
C. The organization's most important information/data assets
D. Who is responsible for the information/data assets

11.45 The EU's data protection directive is focused on three simple principles. Which of the following is not one of the defining principles?

A. Financial value
B. Transparency
C. Legitimate purpose
D. Proportionality

11.7 Review Question Answers

True/False Answers

11.1 F, 11.2 F, 11.3 T, 11.4 T, 11.5 T, 11.6 F, 11.7 F, 11.8 F, 11.9 T
11.10 T, 11.11 F, 11.12 F, 11.13 T, 11.14 F, 11.15 T, 11.16 T, 11.17 T
11.18 F, 11.19 T, 11.20 T, 11.21 T, 11.22 F, 11.23 F, 11.24 T, 11.25 F
11.26 T, 11.27 F, 11.28 T, 11.29 T, 11.30 T, 11.31 T, 11.32 T, 11.33 F

Multiple Choice Answers

11.34 C, 11.35 D, 11.36 B, 11.37 C , 11.38 D, 11.39 D, 11.40 A
11.41 D, 11.42 D, 11.43 D, 11.44 A, 11.45 A

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