Information systems development and management

C. Avgerou

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Contents

Chapter 1: Introduction

About this course

ICT innovation in organisations has a history of more than half a century and is continuing unrelentingly. It has given rise to a variety of specialist jobs – from computer programmers to chief information officers (CIOs) with a varying mix of technology and managerial competencies. The knowledge and skills needed for information systems (IS) jobs are continuously changing. The mainframe era required computer operators, large numbers of computer programmers, systems analysts and designers, and relatively few IS managers with business management skills. There were some large computer service providers running standard applications, such as payroll, but most large companies had their own electronic data processing (EDP) departments, and that is where most IS professionals were employed.

By the turn of the twenty-first century nearly every organisation – at least in the industrialised world – used computers, but IS jobs have changed. Computer operators have almost disappeared, and most software is developed by software firms. Information and communication technology (ICT) user organisations had fewer programmers and designers among their staff, but they needed specialists for configuring complex software packages, such as enterprise resource planning (ERP) packages, as well as business analysts, knowledge base administrators, information managers, webmasters and IS security specialists. Ten years later, at the time I am writing this subject guide, many organisations are contemplating the transfer of their information systems to cloud computing, thus buying software services rather than maintaining their own IT teams and owning their own IT applications. At the same time, managers are, perhaps reluctantly, experimenting with social networking such as Facebook or Twitter to support the collaborative work of their employees or to connect with customers, and some organisations have introduced virtual reality applications such as Second Life. Most organisations employ only a few programmers, systems analysts and designers – though large numbers of such specialists are employed in the software industry and corporations that need to be at the frontiers of IS innovation. There is still increasing demand for security experts, business analysts, webmasters, consultants and, importantly, executives with a good understanding of the new business models enabled by ICT and what it takes to implement them.

One thing is certain: IS careers have always been and will continue to be challenging and exciting. There is little danger of boredom from exercising the same skills routinely on the same tasks year after year. IS professionals need to master new technologies and techniques, to make sense of new ideas about the way organisations can do business, to distinguish essence from hype and probably advance their careers by moving to different employment environments and job contracts.

What kind of education can prepare you for such a dynamic career path? This is an area containing multiple types of technical knowledge: from the functional details of a range of technologies, through the various techniques of management, to the understanding of how technological and organisational change happens in modern society. Before we go further I should start by outlining the scope of this course, which is intended to develop competencies for future IS innovators, so that you

understand the logic that connects the large range and diverse topics you will need to study.

To begin with, it is helpful to clarify the three core notions of this course: 'information systems', 'information systems innovation', and 'information systems management'. This course builds on the conceptual foundations laid by **60 Introduction to information systems**, and is concerned not with technology applications as such but with IS, which are understood as socio-technical entities that may involve a variety of ICT but always involve people in particular organisational settings.

We will be studying the efforts people in organisations make for **information systems innovation**. Information systems innovation comprise the development and management of both new technology components and new organisational arrangements. In other words, IS innovation is broader than the development of technology-based information handling systems. In our study, the development, deployment and use of technologies **and** organisational change are the two inseparable aspects of an IS innovation process. Organisational change includes changing the way an organisation is structured, its work processes, its products and services as well as its relationships with the other organisations and individuals it works with.

Consequently, **information systems management** is concerned with the structures organisations put in place and the processes they follow to direct, and benefit from, information systems innovation. These structures and processes are concerned not only with technologies and information processes but with the way ICT-based information and communication processes fit in and support the work practices of an organisation or enable it to change. In these days, when organisations are continuously seeking better ways of structuring their tasks and achieving control information systems management is inseparable from the management of change.

In your study of this course you will acquire three kinds of knowledge.

1. **Descriptions of technologies – what organisations do with ICT, the problems they face, and the results they achieve.**
   Such descriptive knowledge is necessary to establish an understanding of the various 'objects' and 'issues' which preoccupy IS professionals. This knowledge is presented in the literature in a matter-of-fact style and is often condensed in lists, tables and diagrammatic models. Most importantly, these descriptions give us the jargon used to refer to various types or components of information systems and organisations that develop, use and manage them. For example, in McNurlin et al. (2009) (one of the course textbooks) we find a neat description of 'system integration', one of the 'biggest software problem CIOs face', a list of three different technological approaches to address this problem and brief outlines of each of them.

   Information systems in practice include a vast range of technologies and organisational arrangements. It is impossible to cover them all in a one-year course syllabus. In this course you will have to get familiar with a selection of IS technologies and organisational structures and practices. But I assume you do not start from scratch. You will have already acquired a great deal of such knowledge both from your everyday life and from other subjects of your programme. In particular, course **60 Introduction to information systems** and its readings are a valuable source that you should continue to refer to. You should also get into the habit of reading newspapers and specialist professional

publications so that when you have finished your degree you stay up-to-date in a continuously developing field of expertise.

2. **Descriptions of methods, techniques, and guidelines for conducting the various tasks of ICT-enabled innovation.** This is **prescriptive** knowledge, which tells IS specialists what to do and how. Such knowledge assumes that teams of professional managers and technology experts are in command of the information systems innovation process. With appropriate skills and tools they can reach the right decisions on what innovation is required, perform appropriate technical tasks and steer the innovation process towards successful outcomes. The nature of information systems means that this knowledge combines techniques fostered in three disciplines: **engineering** for the systematic design and construction of technology artefacts; **economics** to trace the imperatives and choices that drive innovation in organisations competing in a market economy; and **management** to guide decision-making and actions in organisations.

None of these three disciplines is a precise science guaranteeing successful results. They rely on simplifying models of organisations as systems functioning in a generally rational manner to fulfil generally accepted rational objectives. They tell us what 'ought to be done' in a rationally functioning world of organisations. But the dynamics of organisations and their context – the industry they are part of, the market within which they compete or the national and international societies of which they are part – are not adequately captured in such models. Good engineering and effective economic decisions and management are much more complex areas of activity than the competent use of a set of engineering, managerial or economic techniques.

Consider, for example, the various methods for IS development based on the life cycle model, which will be discussed in some detail in Chapter 4. They include software engineering techniques, such as systems analysis and design notations, economic techniques, such as cost benefit analysis for establishing the feasibility of an IS option, as well as project management tools for allocating resources. Every IS professional involved in a systems development project must have knowledge of these fundamental techniques. Yet, using the life cycle as the model for assembling these technical skills is controversial. Although it is practised widely it may run into problems and it is not necessarily the most cost-effective way to develop new systems. Project managers and analysts cannot rely on their knowledge of techniques for a successful project. They need to be alert, sometimes modify their techniques and sometimes abandon them. Textbook prescriptions of 'best practice' for managers and systems analysts to follow leave many gaps that are filled by the judgment of practitioners themselves.

3. **Conceptual analyses of IS innovation are intended to help you think in more abstract terms than a specific technology or technique.** They often take the form of a theory that helps us to think systematically about the logical justification and potential consequences of some course of action. Theory makes specific assumptions about the nature of IS innovation, organisations and technology, and provides a particular perspective of an activity or a problem. It can be thought of as a lens that allows us to see closer some aspects of a phenomenon, so that we can understand it, explain it and perhaps predict what will happen next. Such knowledge is necessary for IS professionals to form judgements that are needed to fill the gaps and inadequacies of prescriptive knowledge.

A good professional will need to complement descriptive and prescriptive knowledge of what happens – what should be done and how – with analytical understanding of the process of innovation. Consider again the example of systems development by following the life cycle model. If a project manager notices that their standard methods for capturing the specifications of a new system are not effective, and they get contradictory and incomplete requirements from the business unit that the system is intended to support, they will need to consider what the nature of the problem is. It might be that this business unit has not planned properly what new processes they wish to implement and have not provided the systems developers with a clear business model according to which information processing specifications can be drawn. If this is the case, the IS project manager may refer the problem to the business planners and expect them to provide better business models. Or they may decide that clear and unambiguous planning for new processes that rely on new ICT is impossible, in which case they will have to proceed knowing that the specifications are incomplete and problematic. In this case a more dynamic and flexible course of action may be called for. They may decide to modify the project so that software and data management tools can be developed, which can be easily adapted and co-evolve with the way business processes will take shape. It may be that our hypothetical project manager realises that the root of the problem is that the employees of the business unit are uncooperative, suspicious of the business process redesign and the technologies that will support them, and that they are hiding, or misrepresenting, important aspects of how business can be effectively conducted. If this is the case, they will need to consider whether to proceed with the project and how this 'user resistance' may be addressed. To help you develop the capacity for such vital analytical thinking, I have included alternative theoretical perspectives on information systems innovation.

Aims and objectives

To study this course as part of a BSc degree, you must have previously completed either **60 Introduction to information systems** or **136 Information systems and organisations**. I therefore assume you will have a general understanding of the nature of information systems, relevant technologies and the life cycle model of systems development. The aim of this course is to develop an overall understanding of the nature of the effort required to exploit the potential of ICT innovation in contemporary organisations. This course does not study any particular technology. Nor does it study in-depth techniques for systems development, such as design, programming or evaluation. Some of these are covered in **103 Elements of information and communication technologies** and **61 Software engineering**. Rather, this course provides a critical understanding of the tasks IS professionals perform, on the basis of which IS decisions and actions can be taken.

More specifically, the aims and objectives of this course are to:

- explain why organisations need to manage their information systems and introduce existing knowledge on effective management

- introduce approaches for pursuing IS innovation, that is, for developing new ways of doing their business by implementing new ICTs

- explain what options organisations have when acquiring the information systems they need and introduce the methods and guidelines professionals follow to do so

- develop the critical ability to analyse the issues confronting IS innovation, thus enabling IS professionals to exercise their own judgement when routine use of relevant methods and techniques fails to produce satisfactory results.

Learning outcomes

By the end of studying this course, and having completed the Essential reading and activities, you should be able to:

- discuss the process of information systems innovation as a socio-technical endeavour that comprises both technology and organisational change
- identify the main trends in the socio-economic context of organisations that affect IS innovation
- critically discuss the relationship between ICT and organisational change
- discuss the strategic value of information systems for organisations and methods used for information systems planning
- critically discuss the options organisation have to acquire the technologies they need for their information systems
- critically discuss some of the most frequently used methods for developing and implementing information systems
- describe the tasks involved in managing IS development and implementation projects
- discuss the challenges facing information systems management
- explain the notion enterprise governance of IT
- identify the security risks confronting information systems and the mechanisms used to address them
- critically discuss threats to privacy associated with the use of ICTs in organisations.

Syllabus

Technology, organisational, and social aspects of information systems innovation: the context of information systems innovation; the value of information systems in business firms and public sector organisations; concepts and theories for the study of information systems innovation.

Information systems development: tasks and methods; information systems development routes (in-house systems development, sub-contracting, packaged software product); the life cycle; critique of the life cycle; models, approaches and methodologies.

Information systems management: information systems project management; information systems planning; management of outsourcing; information systems as a service; organisational structures for the management of IS resources; enterprise governance of IT; management of information systems security; privacy protection.

Information systems and organisational change: alignment of IT and business strategy; enterprise governance of IT; information systems planning; critique of the IS planning; incremental IS innovation and organisational change through practice; e-government and public sector reform; soft systems methodology for the identification of organisational problems and areas for information systems innovation.

How to use this subject guide

This subject guide is intended to direct you to relevant materials and their sources. It is, however, more than a mere list of topics, relevant readings and advice about what to study. It outlines the most important issues of information systems development and management, directing your attention to the most important aspects that you should study in the literature. This guide should not be taken as a substitute for reading the sources that elaborate on the issues mentioned. Its purpose is to help you find your way into the literature; it is not an adequate summary of the literature to rely on for examination purposes.

Each chapter starts with a reading list for the topics it covers. It is divided into Essential and Further reading. The Essential reading list sets out the minimum you need to read to cover the syllabus. Once you have finished a chapter, check that you have done all the Essential reading. The Further reading list includes books and articles that will enhance your knowledge and understanding of the subject. Throughout the chapters you will find references to books and papers that you should read to understand the issues. You should read as much of these as you can.

All chapters combine descriptive, prescriptive and conceptual knowledge on IS topics. They start with the outline of the topic they cover, then describe it and introduce concepts and methods. When appropriate, they include sections of critical reflection, which invite you to engage in more analytical thinking. These sections introduce additional concepts and theories, which show aspects of a topic in a particular way. For example, in Chapter 3, I will first take you through an outline of 'conventional' good practice about the importance of planning for future IS innovation projects with declared business objectives. I will introduce several methods for such planning and I will give you directions for relevant reading. Then, in the section **Critical reflections on IS planning** we will cover critiques of the wisdom of such 'good practice'. These critiques are not just random thoughts. They are underpinned by research findings which suggest that what is described as good practice does not necessarily deliver desirable results, or that there are important challenges that need to be addressed. Equally importantly, they are underpinned by theories which tell us that the topics and issues under discussion can be seen differently, and they reveal that there is a different logical way to perceive what is happening and what kind of action is needed.

I should stress that the more nuanced analyses in the critical reflection sections are not intended to show that the main body of knowledge on the topic that is under discussion is false and to reveal the view that is correct. The most important achievement you should aim at with your reading for each chapter, is to understand a range of relevant issues and practices in an area of professional activity. The final chapter has more guidance on that, through literature that is analytical and theoretical. This guide and the suggested readings are intended to develop your capacity to think for yourself about what are the appropriate things to do, not to tell you what to do and how.

Every chapter also includes activities. I strongly recommended you to do them to understand the various topics that this course covers. Some of these activities require a little research, such as reading news magazines or talking with people from an organisation about their experience with IS projects. I recommend doing two things from the start of this course. The first is to read a magazine such as *The Economist* or a weekly newspaper regularly and look for articles or news related to IT in organisations. You may find such articles in the business section of the magazine or newspaper. Secondly, visit two or three business firms or local authority offices and talk to a manager responsible for their information systems. Ask permission to talk to some of their staff when you need information for various topics that you will study, such as the way they managed a recent IS project.

At the beginning and end of each chapter you will find a list of learning outcomes. Learning outcomes tell you what you should have learned from that chapter of the subject guide and the relevant reading. You should pay close attention to the learning outcomes and use them to check that you have fully understood the topics.

A warning about terminology: the literature on information systems has no standardised terminology and lacks precise definitions. You may find the different terms different authors use to refer to the various categories of people involved in IS development confusing. Some authors maintain a fundamental distinction between 'systems developers' and 'users'. These are terms that I will also use in the subject guide. But these are two general categories, and these days the relationship between them is quite complex when analysing the options for IS innovation. Many authors use different terms, such as 'analysts' or 'vendors' to refer to people who supply the technical services or products for IS innovation, and use terms such as 'stakeholders', 'customers', 'clients' or 'actors' to refer to those who will live with the resulting information system and therefore need in some way to be taken into account or be involved in the innovation process. In many cases it is clear why an author uses a particular term rather than another. For example, in the outsourcing literature it makes sense to refer to the relationship of two main categories of 'vendor' and 'customer' or 'client'. In other cases the choice of terms is theoretically driven. For example, the use of the term 'stakeholders' in IS project management conveys the theoretical view that the success of a project depends on the extent to which the project addresses the concerns and interests of a diverse range of people within and outside the organisation, each with different forms and degrees of power. It is therefore important for the success of a project to identify 'stakeholders', understand their interests, find ways to accommodate them and assess the effects of their power.

A similar confusion surrounds the terms 'methods', 'methodologies', 'techniques' and 'models' regarding IS planning, project management and the various tasks of systems development. For example, McNurlin et al. (2009) talks about 'techniques' of IS planning, while Earl (1989) refers to these as 'methods'. I will use these terms interchangeably, except in the discussion of 'methodology' in Chapter 4.

Recommended study time

The minimum time required for the study of this course is one day of reading a week for 25 weeks. In addition, the activities recommended in this subject guide will require reading local news or international magazines for relevant news and analysing the case studies in the

textbooks. This course covers diverse topics and you may need to devote more time to understanding certain topics, whereas you may find that you need less time for others.

Structure of the subject guide

The course syllabus is covered in six chapters.

Chapter 2 introduces readings that will help you understand the broader context within which IS innovation takes place. This includes the technologies that comprise information systems, the broader business environment in the current globalised economy and the internal environment of innovating organisations. The public sector is discussed in a different section. Although IS innovation in the public sector draws extensively from the descriptive and prescriptive knowledge developed in the private sector, there are important issues that require particular attention. These are related to the nature of public sector organisations and the particular aspirations of e-government (the name given to IS innovation in this sector) for public sector reform and enhancement of democracy. The reflection section of Chapter 2 critically discusses the relationship between IT innovation and socio-economic and organisational change. I also explain why you should be careful not to think that the introduction of IT leads always to beneficial effects and to be aware about potentially undesirable effects.

Chapter 3 introduces the 'IS project' as the way that major IS innovation work is organised. An IS project is made up of multiple tasks, ranging from developing software to working out procedures for the smooth operation of the resulting socio-technical system. I then introduce you to the literature on how IS projects come to be identified and initiated. A major message from the IS literature is that IS projects should not just aim to develop new systems using the latest technologies, but they should aim to serve the strategic needs of the organisation. This necessitates planning, and a good part of Chapter 3 guides you to existing knowledge on methodical IS planning. I introduce also a particular approach, the soft systems methodology, for reaching decisions in cases in which the potential benefits of a suggested IS project are unclear and perhaps controversial. Finally I outline the subsequent series of tasks that make up an IS project. The reflective section of this chapter concerns the critiques of the ideas and methods of IS planning and introduces alternative approaches pointing out that effective innovation often emerges incrementally as people in organisations make sense of the potential of new technologies and accommodate them in their work.

Chapter 4 focuses on the tasks required to develop an information system. In this chapter, I assume that an IS project involves developing the software and the other IS components identified in Chapter 2 to fulfil the specific needs of an organisation – in other words, I assume in-house systems development. The chapter follows the life cycle model of systems development, which prescribes a staged succession of technical tasks. I introduce briefly the tasks involved in the life cycle stages. The aim here is to understand what these tasks entail; not to learn how to perform them. I also introduce prototyping, as a method commonly used in IS development either to facilitate tasks of the life cycle or as an alternative approach to the life cycle, and I discuss briefly systems development methodologies, as a set of methods and tools used to systematically carry out the tasks of the life cycle. The reflective sections of Chapter 4 concern the following three issues. The first is concerned with 'resistance to change'. I discuss briefly

what resistance to change may signify and why it has to be taken seriously. The second critical issue concerns the merits and shortcomings of the life cycle itself. I discuss why the life cycle is considered unrealistic in its organisation of systems development into a linear succession of tasks. The third critical issue concerns the extent to which IS development should be considered as an engineering effort, aiming at building high quality technologies, or as a socio-technical intervention that aims to satisfy human needs in a social environment.

Chapter 5 extends the discussion of systems development beyond the tasks of the life cycle. I introduce the way IS projects accommodate effort for designing organisational change by modelling new business processes that the IS systems under development should aim to support. Also I introduce ways of acquiring ('sourcing') the various components of the system other than developing them in-house. I discuss the effort required to develop information systems by purchasing software as ready-made products. I identify two different cases of implementing software packages: the Enterprise Resource Planning (ERP) software that requires a great deal of effort to configure it for the specific business processes of an organisation; and packages with generic functionality, such as software to support collaborative office work, that tend to require minimal effort to implement and are shaped by their use in organisations. I discuss also the development of intranet- and internet-based systems. Finally, I introduce open source software and describe the way it is produced. The reflection sections of this chapter concern two issues. The first is the way organisational change occurs in association with IS development. The same concerns regarding the limitations of planned organisational change discussed in Chapter 3 resurface here and I discuss relevant theoretical views. The second issue concerns the production of open source software and the extent to which it is an alternative to planned and methodical systems development. I discuss theoretical views explaining how high quality software products are developed by voluntary collaboration, apparently without systematic analysis, planning and management, and without financial rewards.

Chapter 6 guides you through the literature on four areas of IS project management. The first is concerned with managing IS projects. By now you should have acquired a good understanding of the tasks involved in systems development, so the section on IS project management picks up the issues of how these tasks can be managed within the set time and budget of a project (introduced in Chapter 3). It introduces relevant management tasks and techniques. The second area of IS management is concerned with managing outsourcing, which is widely practised nowadays for acquiring information systems. I extend the traditional notion of outsourcing as subcontracting a systems development project, or parts of it, to a company with specialist skills to include the emerging ideas and practices of acquiring IS as a service delivered through 'cloud computing'. The third area of IS management effort concerns IS governance, which refers to the ways organisations distribute responsibility for decisions on their overall IT infrastructures. I discuss relevant organisational structures, the arguments for including IS innovation within the business strategy, and, consequently, for allocating responsibility at the highest level of management of an organisation. The fourth area of IS management concerns safeguarding the integrity of information systems and the data they include. I highlight also the need for taking care to protect the privacy rights of those whose personal data are stored in and handled by an organisation's information systems.

Finally, in Chapter 7, I look back at some of the most important issues raised in earlier chapters that require practitioners to exercise their judgement rather than simply follow 'good practice' guidelines or methods. I explain that the IS literature addresses the issues confronting IS practitioners in three different ways: **functionalist** – which aims to identify what needs to be done by analysing the problem; **interpretivist** – which aims to understand what the issue *is* by examining how different stakeholders perceive a problem or an opportunity and how they make sense of it; and **critical** – which examines how IS innovation affects different stakeholders and points out that the benefits of innovation may not be distributed equally among them and may leave some worse off. I then guide you to theoretical literature that discusses concepts and theoretical ways of thinking about three main issues: the need to consider the social context of IS innovation; the controversy about whether IS practitioners should play a leading role in decisions on IS innovation or should leave the leading role to general management; and the views that suggest that IS innovation cannot be achieved by planning techniques and design methods, but requires flexibility, spontaneity of action and agility, and that it needs to be seen as continuing beyond the implementation of the project.

Reading

Essential reading

You will need to read extensively from two textbooks and should purchase copies of these:

Avison, D. and G. Torkzadeh *Information Systems Project Management.* (Thousand Oaks, CA: Sage, 2009) [ISBN 9781412957021].

McNurlin, B.C., R.H. Sprague, Jnr. and T. Bui *Information Systems Management in Practice.* (Englewood Cliffs, NJ: Prentice Hall (Pearson International), 2009) [ISBN 978013157951].

Although there is a lot of overlap between these two textbooks, they differ widely in the ways they present the topics they cover. McNurlin, Sprague and Bui's book is very 'businessy' in style, with almost all the examples and case studies drawn from the US. I will refer to it extensively for descriptive knowledge because it contains good descriptions of technologies and prescriptions of business practices, with the jargon used by practitioners. But it offers little reflective analysis and critical discussion. It takes for granted that there is a business logic that makes particular ways of practising IS innovation imperative. Avison and Torkzadeh's book is also mainly descriptive and it covers in great detail project managements and various techniques used in systems development.

You will need to read chapters from Avgerou and Cornford's book *Developing Information Systems: Concepts Issues and Practice* (Basingstoke: Macmillan, 1998) [ISBN 9780333732311]. This book is limited in descriptions of technologies and business practices. It is also quite old and doesn't cover many of the options and issues of IS innovation nowadays. But it contains a good description of the systems development tasks, which is part of the core knowledge of the IS practice.

You will also need to read chapters from a few other books and a number of articles in academic journals. I will recommend readings throughout this guide.

To study this course you have to cope with quite a big and diverse bibliography. This requires a particular way of reading: understanding the main arguments of the texts, judging the validity of the evidence the authors marshal in support of their arguments and forming a view of their merits and drawbacks. You should be prepared to read texts that have diverse views. You should gradually learn to appreciate the scope and the merits of each of these readings, discover their weaknesses and build well-informed and convincing arguments on the matter concerned. I don't expect you to read all the recommended texts from cover to cover.

Start with the Essential reading and, following the advice given in the subject guide, decide how much of the additional material you need to read and in what depth. The more you read, the more sophisticated answers you should be able to write for your examination.

Detailed reading references in this subject guide refer to the editions of the set textbooks listed above. New editions of one or more of these textbooks may have been published by the time you study this course. You can use a more recent edition of any of the books; use the detailed chapter and section headings and the index to identify relevant readings. Also check the virtual learning environment (VLE) regularly for updated guidance on readings.

Recommended reading

Avgerou, C. and T. Cornford *Developing Information Systems: Concepts, Issues and Practice.* (Basingstoke: Macmillan, 1998) [ISBN 97800333732311] Chapters 2–6.

Baskerville, R., J. Pries-Heje and B. Ramesh 'The enduring contradictions of new software approaches: a response to "Persistent problems and practices in ISD"', *Information Systems Journal*, 17(3) 2007, pp.241–45.

Beynon-Davies, P., H. Mackay, et al. "'It's lots of bits of paper and ticks and post-it notes and things...': a case study of a rapid application development project",*Information Systems Journal* 10(3), 2000, pp.195–216.

Ciborra, C.U. 'De profundis? Deconstructing the concept of strategic alignment', *Scandinavian Journal of Information Systems* 9(1) 1997, pp.67–82.

Ciborra, C.U. 'The grassroots of IT and strategy', C.U. Ciborra and T. Jelassi (eds) *Strategic Information Systems*. (Chichester: John Wiley, 1994) pp.3–24 [ISBN 0471941077].

Damsgaard, J. and R. Scheepers 'Managing the crises in intranet implementation: a stage model', *Information Systems Journal*, 10(2), 2000, pp.131–49.

Fitzgerald, B. 'The transformation of open source software', *MIS Quarterly* 30(2) 2006, pp.587–98.

Fountain, J.E. *Building the Virtual State: Information Technology and Institutional Change*. (Washington, D.C.: Brookings Institution, 2001) [ISBN 0815700777].

Kautz, K., S. Madsen, J. Nørbjerg 'Persistent problems and practices in information systems development', *Information Systems Journal*, 17(3) 2007, pp.217–39.

Land, F.F. and R.A. Hirschheim 'Participative systems design: rationale, tools and techniques', *Journal of Applied Systems Analysis*, 10, 1983, pp.91–106.

Layne, K. and J. Lee 'Developing fully functional e-government: a four-stage model', *Government Information Quarterly* (18:2) 2001, pp.122–36.

Lin, A. and , T. Cornford 'Sociotechnical perspectives on emergence phenomena' in E. Coakes, D. Willis and R. Lloyd-Jones (eds) *New Sociotech: Graffiti on the Long Wall.* (Godalming: Springer, 2000), pp.51–60 [ISBN 9781852330408].

Markus, M.L. 'Technochange management: using IT to drive organisational change', *Journal of Information Technology* (19:1) 2004, pp.4–20.

Markus, M.L. 'Power, politics and MIS implementation', *Communications of the ACM* (26:6) 1983, pp.430–45.

Markus, M.L. and R.I. Benjamin 'Change agentry – the next frontier', *MIS Quarterly*, (20:4) 1996, pp.385–407.

Markus, M. L., S. Axline, et al. 'Learning from adopters' experiences with ERP: problems encountered and success achieved', *Journal of Information Technology*, 15(4) 2000, pp.245–65.

Orlikowski, W.J. 'Improvising organisational transformation over time: a situated change perspective', *Information Systems Research* 7(1), 1996, pp.63–92.

Parr, A. and G. Shanks 'A model of ERP project implementation', *Journal of Information Technology*, 15(4) (2000), pp.289–303.

Porter, M. and V. Millar 'How information gives you competitive advantage', *Harvard Business Review*, 63(4) 1984, pp.149–60.

Raab, C.D. 'Privacy protection and ICT: issues, instruments, and concepts' in R. Mansell, C. Avgerou, D. Quah, and R. Silverstone (eds) *The Oxford Handbook of Information and Communication Technologies*. (Oxford: Oxford University Press, 2007), pp.427–48 [ISBN 9780199548798].

Sambamurthy, V. and R.W. Zmud 'Arrangements for information technology governance: A theory of multiple contingencies', *MIS Quarterly*, 23(2) 1999, pp.261–90.

Van Grembergen, W. and S. De Haes *Enterprise Governance of Information Technology: achieving Strategic Alignment and Value.* (New York: Springer, 2009) [ISBN 9780387848815] Chapter 1.

Walsham, G. *Interpreting Information Systems in Organisations*. (Chichester: John Wiley, 1993) [ISBN 0471938149] Chapters 1 and 3.

Weill, P. 'Don't just lead, govern: How top-performing firms govern IT', *MIS Quarterly Executive*, 3(1) 2004, pp.1–17.

Further reading

Please note that as long as you read the Essential reading you are then free to read around the subject area in any text, paper or online resource. You will need to support your learning by reading as widely as possible and by thinking about how these principles apply in the real world. To help you read extensively, you have free access to the VLE and University of London Online Library (see below).

Other useful texts for this course include:

Avgerou, C. 'Evaluating information systems by consultation and negotiation', *International Journal of Information Management*, 15(6) 1995, pp.427–36.

Avgerou, C. and T. Cornford, 'A review of the methodologies movement', *Journal of Information Technology*, 5 1993, pp.277–86.

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You should also be aware of the academic and business journals that contain articles relevant to this course. The most frequently referenced are:

European Journal of Information Systems

Harvard Business Review

Information and Management

Information and Organisation

Information Systems Journal

Information Systems Research

Journal of the Association for Information Systems

Journal of Information Technology

MIS Quarterly.

All these journals are available in the online library of the University of London International Programme. You should become familiar with them and get into the habit of skimming through their latest issue and reading articles that you find relevant to this course.

The topics discussed in this course often appear in weekly and monthly magazines and in newspapers. For example, the weekly magazine *The Economist* and the daily business newspapers the *Financial Times* and the *Wall Street Journal* regularly publish relevant news and surveys. I suggest you make a habit of regularly searching them for relevant articles. You should also search for relevant articles in your country's newspapers and magazines. They will be an invaluable source of examples and case studies, to overcome the unfortunate parochialism of those cited in the textbooks.

Online study resources

In addition to the subject guide and the Essential reading, it is crucial that you take advantage of the study resources that are available online for this course, including the VLE and the Online Library.

You can access the VLE, the Online Library and your University of London email account via the Student Portal at: http://my.londoninternational.ac.uk

You should have received your login details for the Student Portal with your official offer, which was emailed to the address that you gave on your application form. You have probably already logged in to the Student Portal in order to register! As soon as you registered, you will automatically have been granted access to the VLE, Online Library and your fully functional University of London email account.

If you forget your login details at any point, please email uolia.support@london.ac.uk quoting your student number.

The VLE

The VLE, which complements this subject guide, has been designed to enhance your learning experience, providing additional support and a sense of community. It forms an important part of your study experience with the University of London and you should access it regularly.

The VLE provides a range of resources for EMFSS courses:

- Self-testing activities: Doing these allows you to test your own understanding of subject material.

- Electronic study materials: The printed materials that you receive from the University of London are available to download, including updated reading lists and references.

- Past examination papers and *Examiners' commentaries*: These provide advice on how each examination question might best be answered.

- A student discussion forum: This is an open space for you to discuss interests and experiences, seek support from your peers, work collaboratively to solve problems and discuss subject material.

- Videos: There are recorded academic introductions to the subject, interviews and debates and, for some courses, audio-visual tutorials and conclusions.

- Recorded lectures: For some courses, where appropriate, the sessions from previous years' Study Weekends have been recorded and made available.

- Study skills: Expert advice on preparing for examinations and developing your digital literacy skills.

- Feedback forms.

Some of these resources are available for certain courses only, but we are expanding our provision all the time and you should check the VLE regularly for updates.

Making use of the Online Library

The Online Library contains a huge array of journal articles and other resources to help you read widely and extensively.

To access the majority of resources via the Online Library you will either need to use your University of London Student Portal login details, or you will be required to register and use an Athens login: http://tinyurl.com/ollathens

The easiest way to locate relevant content and journal articles in the Online Library is to use the **Summon** search engine.

If you are having trouble finding an article listed in a reading list, try removing any punctuation from the title, such as single quotation marks, question marks and colons.

For further advice, please see the online help pages: www.external.shl.lon.ac.uk/summon/about.php

Unless otherwise stated, all websites in this subject guide were accessed in 2007. We cannot guarantee, however, that they will stay current and you may need to perform an internet search to find the relevant pages.

Examination advice

Important: the information and advice given here are based on the examination structure used at the time this guide was written. Please note that subject guides may be used for several years. Because of this we strongly advise you to always check both the current *Regulations* for relevant information about the examination, and the VLE where you should be advised of any forthcoming changes. You should also carefully check the rubric/instructions on the paper you actually sit and follow those instructions.

Examination questions will require short essays, demonstrating critical understanding of the subject material.

The examination paper has two sections. Section 1 contains straightforward questions, which can be answered on the basis of the essential readings of specific chapters of the subject guide. Questions in Section 2 require more critical or reflective answers; you will have to draw from a range of readings to form relevant arguments and to demonstrate understanding of the issues involved. The readings recommended in the critical reflection sections of the subject guide and Chapter 7 are of crucial importance for answering the questions in Section 2. You must answer four questions: two from each section.

Answers should be succinct in addressing the particular points of the question. Long essays rambling over everything you know on the broader subject matter of the question will not earn you high marks. On the contrary, they tend to miss the specific required answer among irrelevant descriptions and arguments and lose marks, even if they contain aspects relevant to the question. In questions asking you to 'outline' or 'briefly describe' a topic, you should write compact descriptions and leave plenty of time to move on and think and plan for the critical parts of the question, which tend to bear a higher proportions of marks.

Remember, it is important to check the VLE for:

- up-to-date information on examination and assessment arrangements for this course
- where available, past examination papers and *Examiners' commentaries* for the course which give advice on how each question might best be answered.

Chapter 2: IS innovation in context

Learning outcomes

Having completed this chapter, and the activities and Essential reading, you should be able to:

- recognise IS innovation as a managed process of technology implementation and organisational change
- describe the context of IS innovation in terms of available technologies, broad socio-economic trends and organisational trends
- describe the main categories of ICT comprising contemporary information systems
- describe the main trends in the external environment of business organisations
- describe the main trends in the internal environment of business organisations
- describe the main trends of reform of public sector organisations
- describe the main benefits associated with IS innovation
- critically discuss the relationship between ICT and organisational change
- explain why investment in ICT does not necessarily achieve economic performance benefits
- recognise the potentially undesirable effects of ICT innovation
- appreciate the significance of considering the social aspects and human needs of IS innovation.

Essential reading

Fountain, J.E. *Building the Virtual State: Information Technology and Institutional Change.* (Washington, D.C.: Brookings Institution, 2001) Chapter 4.

Layne, K., and J. Lee 'Developing fully functional e-government: a four-stage model', *Government Information Quarterly* (18:2) 2001, pp.122–36.

McNurlin, B.C., R.H. Sprague, Jnr. and T. Bui *Information Systems Management in Practice.* (New Jersey: Prentice Hall (Pearson International), 2009) [ISBN 978013157951] Chapter 1.

Further reading

Dedrick, J., V. Gurbaxani and K.L. Kraemer 'Information technology and economic performance: a critical review of the empirical evidence', *ACM Computing Surveys* (35:1) 2003, pp.1–28.

Hitt, L. and E. Brynjolfsson 'Productivity, business profitability and consumer surplus: three different measures of information technology value', *MIS Quarterly* (20:2) 1996, pp.121–42.

Introduction

The aim of this chapter is to examine how IS innovation enables the use of information technology to add value to organisations and is part of a broader economic and organisational environment.

IS innovation is made up of three interrelated activities:

- the construction and implementation of new information technologies
- the implementation of new, ICT-enabled, organisational structures and work processes
- the management of both of these interrelated processes of change to achieve organisational value.

These activities often take the form of 'projects', endowed with limited resources and clearly stated objectives. However, they cannot be adequately understood without reference to their broader socio-economic and organisational context. For example, at present several organisations encourage their customers to communicate with them through Twitter. This kind of innovation, which uses technologies of 'social collaboration' that can enhance customer relations is still new, with uncertain benefits and unexplored risks. To assess whether it is a sensible innovation for an organisation to pursue, a manager will need to have a good understanding of the 'social collaboration' technology platforms. In addition, they should be able to understand the expectations of the organisation's customers, the regulatory restrictions that will need to be observed and the extent to which this sort of communication can be accommodated within established work structures and the culture of the organisation, or if they require radical change.

From the outset we need to be aware that IS innovation is studied mainly in the context of two types of organisations: business firms and government agencies. Most IS literature refers to innovation in business firms, and most research contributing knowledge that informs IS practice has been conducted in business organisations. You will notice, for example, that McNurlin et al. (2009) refers throughout to IS management in business organisations.

But IS innovation is equally important to both types of organisation, and in this subject guide I will cover both. I will refer generically to 'organisations' when a description or analysis is equally relevant to business and government, and to 'business' or 'government' when a description or analysis refers to private sector enterprises or government agencies more specifically. The two sectors tend to use the same IS technologies, management techniques and analyses. However, there are differences between them, and although public sector IS innovation has relied extensively on ideas and practices established in the business sector, it deserves special attention.

In this chapter, I will take you through readings that describe the current environment of IS innovation in terms of technologies and organisational context. Then I will list the main categories of benefits organisations aim to achieve with IS innovation. Finally, I will raise three issues that require thinking about and suggest how they are addressed in the literature.

The technology environment

IS professionals need to have a good knowledge of ICTs. They should be well-informed about the varieties of technologies used in information systems, their functionality, required conditions for their deployment and use, the way they can be acquired and their costs. As new ICTs continue to reach the market it is important to be informed about the 'trends', that is, the latest clusters of hardware, software, telecommunications and data artefacts and services that are produced and supported by networks of manufacturers and service providers of the ICT industry.

You should read the brief description of hardware, software, data and communications trends in McNurlin et al. (2009) to get an overall view of the range of technologies that make up information systems in contemporary organisations. Some of them are well-established and supported with specific skills and techniques. Others are new, and organisations are experimenting with using them and the new business models they give rise to. Take, for example, two forms of data: databases and web content. Databases rely on well-structured knowledge for their construction and management, partly inscribed in software tools, such as database management systems, and partly supported with well-structured methodical practice for information storage and access. Web content encompasses unstructured or semi-structured types of information, such as text, graphics, animation, maps, photos and video clips. There are no standard methodical practices for putting together and managing such information resources. This job 'is a lot like running a newspaper' (McNurlin et al. 2009).

There is often a tendency to focus enthusiastically on the latest technologies and dismiss the more established ones. This is a mistake because information systems incorporate all types of technologies, old and new. PCs coexist with PDAs and mobile phones; databases coexist with web content; specialised in-house software applications for decision support coexist with Enterprise Resource Planning (ERP) systems as well as with software for virus protection delivered over the internet.

Activity

Talk to a few people who work in various organisations – a bank manager, a sales assistant in a shop, a civil servant in a government department – and ask them what computer technologies they use. Make a list of the technologies used in each case. Consider what benefits they get from each of them.

Consider for a moment what information technologies you use: a mobile phone? a PC? List the applications you use on each of them – internet access on your mobile, word processor, email or Facebook on your PC. How were these technologies provided? Did you buy them or download them for free?

The organisational environment

With business firms in mind, McNurlin et al. (2009) distinguish two layers of organisational environment: the external business environment and the internal organisational environment.

The **external business environment** is characterised by the globalisation of business activity. This means that in a largely open global economy, business firms face competition from firms all around the world. They also tend to use suppliers from, and distribute their products and services to, a worldwide marketplace. Large firms choose to locate parts of their business in places which provide various advantages. A European company may locate its manufacturing plants in developing countries which have cheaper and well-trained labour. Such globalised operations and sales have become much easier since the emergence of internet-enabled ways to link business partners, for example business firms with their suppliers and distributors (B2B) and selling products and services directly to customers (B2C).

There is also a tendency for strategic partnerships to form among networks of companies supporting powerful ICT producers, such as Microsoft and Intel, which McNurlin et al. (2009) call business 'ecosystems'. These partnerships give rise to investment strategies towards clusters of

innovative products or production processes. Another important feature of the contemporary business environment is the importance of ideas and knowledge. In the industrial era economic success required large investments in buildings and machinery. In the 'knowledge economy', firms compete by continuously designing new products and services. Their management needs to focus on cultivating the flow of ideas and knowledge that sustains their competitiveness.

McNurlin et al. (2009) point out a number of other trends in the contemporary business environment, including the emergence of markets for 'micro-products', such as individual songs; faster business cycles to transform innovative ideas into profits; and consumers' expectation for 'instant gratification' in information products and services obtained through the internet.

Two conditions put boundaries to the relentless business competition through ICT innovation. The first is the need to comply with regulations requiring transparency and accountability of corporate operations. In the USA, as well as many other countries, such regulations became necessary after the discovery of corrupt practices and over-hyped promotion of the potential for wealth creation from ICT innovation in the late 1990s. More regulation, particularly targeted at the financial sector, is expected in the aftermath of the recent international financial crisis.

The second source of boundaries of acceptability in ICT-enabled innovation stems from the security and privacy threats associated with increasing reliance on computer systems and the internet. Thus, a major concern of IS professionals, paralleling their continuous innovation efforts, is the protection of the integrity of the data resources and information-processing operations of an organisation, with particular emphasis on protecting privacy of individuals whose data they store and handle.

The **internal environment of a business firm** is characterised by business processes that centre on proactive customers. On the one hand, customers drive products and services, for example by providing constantly, through the internet, their views on products and services. See, for example, the posting of customer evaluations of books on Amazon's website. Similarly, travellers' comments on hotels and holiday experiences shape the travel services industry. On the other hand, customers are now expected to do for themselves a number of things that used to be done by employees of business firms. Examples range from ATMs in banks, through placing orders and tracing progress of the delivery of packages by courier companies such as FedEx, to arranging for transactions over the phone by navigating automatic reply options without human communication. Such changes in services tend to be presented as customer empowerment. However, the lack of human communication in many online services often frustrates customers and may have the effect of alienating and losing them.

Other interrelated trends concern the way work is organised. Both strategic and operational decisions rely increasingly on instant access to up-to-date information, such as on the financial status of potential industrial partners or real-time inventory information. Work organised hierachically tends to be restructured and replaced by more flexible working arrangements, with people involved in projects with specific task outcomes. Information work supported by mobile information technologies is less constrained by the fixed location of an office. Moreover, organisations subcontract chunks of work to other companies and deliver products and services by managing workflows that involve multiple business firms.

With these trends in the external and internal context of business firms, McNurlin et al. suggest that management should focus on pursuing the following four goals:

- **Leverage knowledge globally.** Business firms need strategies for innovation that will secure their competitiveness. They will then need to secure the knowledge resources for implementing such strategies by forming networks of knowledgeable people around the globe. They may seek to hire such people from any country and engage them in virtual work teams or form partnerships and outsourcing relationships with local firms in various countries.

- **Organise for complexity.** This means firms should organise themselves to be able to handle complex production and customer service processes, which involve dynamic alliances with other companies.

- **Work electronically.** Growing numbers of operations are handled electronically, often by 'virtual' teams sharing information in corporate databases as well as web-based resources and social collaboration platforms.

- **Handle continuous and discontinuous change.** Innovation in business firms undergo two types of change. One type is carefully-designed large-scale and often radical change, such as the introduction of a new business model. Another type is incremental change that takes shape through continuous adjustment of work processes. I will elaborate more on this distinction in Chapter 3.

Activity

Read the general affairs, economics and business sections of some newspapers or *The Economist* magazine and think about any news items that mention the trends listed above.

The public sector

There are similar trends in the public sector. You must read Fountain (2001) Chapter 4, which describes the way the public sector has been managed according to the principles of bureaucracy and juxtaposes it to a new model of public sector management that she calls 'the virtual state'.

Public sector organisations have been managed according to principles of public administration that are derived from a formal model of organisation known as 'bureaucracy'. According to this model, work is organised in a hierarchical structure of offices performing clearly specified functions. Employees appointed on the basis of professional qualifications (such as economists, lawyers and information systems analysts), and with pre-specified career structures are expected to work by following regulations that implement policies made by the government. This type of organisational arrangement, which was conceived in the context of western democracies, is suitable for the impartial delivery of public services, according to political programmes of action by elected governments which are assumed to express citizens' choice.

A sense of public sector crisis emerged in advanced economies in the 1970s. Public bureaucracies were inefficient and were widely seen to be delivering poor quality services. Almost all countries reformed their public sectors, with ICT as a major enabler of effective and efficient services. Reforms included the introduction of market mechanisms of competition and management practices copied from the business sector.

Many government departments were split up into smaller organisational units and many of their functions were outsourced to private or quasi-governmental agencies. A political vision prevailed in many countries to reduce the size of the public sector, keeping only a core of functions for state administration, regulation and minimal public services as a social welfare safety net, while privatising or outsourcing many services and activities that the public sector had historically performed. In this model, citizens started being seen as empowered 'consumers' of services.

ICT, which in most countries had been extensively used to handle the information-processing needs of the bureaucratic model of public administration, assumed a major role in this new organisational context for the delivery of public services. In particular, the internet allowed a new interface between government organisations and citizens to develop. Initially it made information about public sector services available on the web as well as government regulations and citizens' rights and obligations. Later it enabled transactions between citizens and public sector organisations, such as tax filing, to be done electronically.

E-government emerged as a new organisational model of servicing citizens remotely over the internet. Its implementation requires extensive restructuring of public administration departments to overcome the fragmentation of data resources that had historically been stored and processed by each department's legacy systems. E-government requires information infrastructures that transcend the boundaries of government departments and the various agencies that are entrusted with the delivery of public services. This is not a trivial task. You should read the article by Layne and Lee (2001), which describes the required transformation as a series of stages of building increasingly more complex technology-based organisational processes, starting with providing online information and proceeding towards integrating information-handling processes vertically within layers of government organisations and horizontally across government departments.

E-government faces bigger challenges for safeguarding security and privacy than the private sector. This is because of the interconnectedness of organisations which handle vast amounts of confidential personal data, such as health records, criminal records and child care histories. Effective services require access to personal data by many different professionals in various organisations, for example, health records of national health care systems need to be accessed by physicians, accident and emergency departments and other hospital departments. Such access introduces risks of abuse and violation of personal privacy. I will discuss this crucial issue further in Chapter 6 and talk more about the mechanisms for data protection that need to be in place.

Activity

Search for some information about the way public services are changing in your country. An example could be the introduction of 'one-stop-shops' for government services to citizens. Identify, in particular, services that involve the internet and ask friends and family whether they are happy to use them. Ask them to explain what is it they like about these services and what is it they don't. Find out how those citizens who are not connected to the internet are coping and if they are getting the services their connected neighbours are receiving.

Benefits expected from IS innovation

Within the context of technologies and organisations I outlined above, information systems innovation is associated with the following desirable changes:

- **Increased productivity and efficiency**. This is often the main objective associated with introducing ICT applications in organisations. Ever since the first computer systems were developed in organisations and took on the processing of massive data loads, productivity has been the main objective of most ICT projects. Indeed, through productivity gains, a firm may achieve 'cost leadership', which is an important mechanism to gain competitive advantage. One firm's productivity gains aggregate to macro-level productivity increases and make whole regions and economies more productive and competitive.

- **Improved management and decision-making**, through effective distribution of information, and support for individual or team knowledge work. Relevant technologies include large-scale management information systems (MIS) to specialised decision-support systems (DSS), systems that support teamwork, such as computer-supported collaborative work (CSCW), and more recently social collaboration tools. This is one of the most difficult to quantify of the intangible benefits that organisations strive to achieve.

- **Enhanced business competitiveness**, by affecting a firm's relative position in relation to competitors, suppliers and customers.

- **New business products and new business models**. Organisations often find that they can develop new products and services, alongside their traditional ones, as their data acquire value in the emerging information services economy. Financial data collected by banks and other financial institutions is an example of a by-product of traditional business which becomes a marketable commodity. Organisations such as government departments which routinely collect vast amounts of information may also enter the information market. Many new business opportunities are provided by the spread of the internet. Often these opportunities defy the existing logic of a profitable business. Consider Google, one of the most successful business organisations of our time. Rather than making its income from the information services it provides, it offers these services for free and makes its income from advertising.

- **Improved work arrangements and improved ways customers acquire products and services**. ICT provides opportunities to engage people in more meaningful work tasks. Moreover, completely new possibilities for work arrangements emerge by using mobile technologies.

- **New possibilities in delivering public services**, such as education or health. I have described the aspirations of many governments to improve the efficiency and responsiveness of their bureaucracies by using ICT and in particular by introducing electronic information services to the citizens over the internet. Tele-health and distance learning are two such possibilities, both becoming increasingly realistic as both the internet and relevant software technologies become more widely available.

Critical reflection

The relationship between technology, socio-economic and organisational change

Although it seems obvious that ICT has the capacity to produce the benefits listed above, it is a mistake to consider the implementation of ICT as determining business success or leading necessarily to any of the other benefits associated with it. It is helpful to think of ICT as an 'enabler' for achieving organisational benefits. The most impressive cases of organisations that have managed to exploit the potential of IT have occurred where sectors were going through substantial changes, such as the liberalisation of the financial sector. The restructuring of the sector provided ample opportunities – and risks – for growth and diversification. Information technology was a factor that made it possible for banks to innovate, compete to gain market advantages and increase their revenue. As I emphasise throughout this subject guide, the benefits associated with IT are only achieved with extensive organisational changes.

Both McNurlin et al. (2009) and the e-government readings present the development of ICT-enabled changes of our organisations not as the inevitable 'impact' of advances in technology, but as the convergence of multiple trends in the economy and society. One trend is indeed the availability of new technologies, such as the internet, which allow organisational tasks to be managed and performed differently, and prompt organisations to explore more efficient and effective ways of conducting their activities or indeed to enter new areas of activity. Another trend is towards a global open economy, in which business companies compete by innovation and therefore find ICT a source of new possibilities for developing and distributing their products and services. In the government sector in many countries there has been a trend towards making public sector services resemble those provided by the private sector. This is a political choice, as a number of countries in the 1980s, with prime examples the USA and the UK, embarked on programmes to reduce the size of the state and introduce management practices.

There is no one-directional cause-and-effect relationship between advances in ICT and socio-economic or organisational trends. We cannot say that ICT 'causes' the development of particular ways to do business or deliver government services. Rather, you should understand this relationship as one re-enforcing the other. ICT applications, such as the systems that allow bank transactions to be done over the internet, result from their competitive business making efforts within the open market economy of the financial sector. The availability of new technologies and services prompt re-organisation, new work practices and further new services. In the case of internet banking, banks redeploy staff in local branches to service particular types of customer support that need a visit to the bank, such as changing the terms of an account or negotiating a loan.

ICT and economic gain

Often the benefits associated with ICT fail to be realised. Despite the enthusiasm shown in the business and information systems literature of the 1980s about the potential productivity benefits of ICT, such benefits have not proved straightforward. Empirical studies in the USA in the 1980s and early 1990s caused concern because they did not find gains in productivity, the most straightforward economic benefit expected from the use of IT. Economists found that, at a period of rapid increase in the use of IT, there was a sharp drop in productivity growth. Even after accounting

for other factors, such as increased oil prices, the negative correlation between productivity and diffusion of computers was surprising.

Several explanations were proposed for this productivity paradox. It was suggested that current measures used to account for the economic effects of IT were inadequate, that there may be lags between investment in IT and increased productivity, or that there is widespread mismanagement and misuse of IT.

Since then, refined econometric techniques and the use of ever larger data sets showed a positive correlation between IT investment and productivity in the 1990s in the US and major European economies (Dedrick et al. 2003). Studies in developing countries still fail to show productivity gains from IT investment. More importantly, the economic studies that sought to refute the productivity paradox developed more nuanced theoretical associations of IT and economic performance. One of the main explanations suggested for the differences of productivity gains firms achieve from IT investment is the effectiveness of management practices and the extent to which they work out organisational transformation. In other words, economic studies have confirmed that IT does not automatically deliver economic benefits to a firm. To achieve economic benefits from their investment in ICT, organisations need to change the way they do business. This is a difficult transformation that needs to be managed carefully and for which organisations must develop the required management skills.

Also, economists who looked closer at the way ICT affects the performance of an organisation suggested that productivity is not the most appropriate measure of economic value achieved by introducing new ICTs. Other indicators, such as profitability, financial performance and consumer surplus are more appropriate (Hitt and Brynjolfsson 1996). In an increasingly open and integrated world economy, a great deal of attention is given to IT innovation as a factor of competitiveness. Investment in IT may not lead to an increase of an organisation's productivity, but it may maintain or increase its competitiveness or it may create surplus value for the consumers.

On empowering employees and customers

Many authors, such as McNurlin et al. (2009) and Layne and Lee (2001), present the information systems innovation trends in business and the public sector as positive and desirable for everybody concerned: employees, customers and citizens. They often talk about 'empowerment' of people. However, this is not necessarily the case.

Employees may not be able to support the new processes. In many cases organisations using ICT to lower their costs and achieve productivity have created unpleasant work conditions rather than empowering employees. There are similar effects for customers. I am sure you have had the experience of trying to communicate with a firm's customer services department over the phone, getting through to an automated answering system that makes you hear lots of irrelevant information and choose from numerous irrelevant options, and either gives no option to communicate with a person, or allows you to do so only at the very end of a long process of selecting and pushing phone buttons. The ICT-enabled self-service trend in services is not always 'empowering'.

The darker side of ICT in society

Finally you should be aware that entrepreneurship and innovation can and do flourish in the darker corners of society and that IS innovation serves also illegal and unethical activities such as drug trafficking, money laundering and pornography. Cybercrime, as well, is a new threat for business organisations and governments. I will discuss this threat and how it can be managed in Chapter 6. At this point it is imprtant to understand that IT is used not only for socially good purposes, such as economic growth and innovative services, but also in activities that are seriously damaging. It is, of course, important that IS experts do not implement IT for illegal and unethical purposes. It is also their professional responsibility to understand such threats and include adequate mechanisms of protection in the technical and management components of the information systems infrastructure of the systems they develop.

Conclusion

In this chapter I have argued that it is important for IS professionals to understand the nature of IS innovation as comprising the implementation of technologies, organisational change and the management of both. It is also important for IS professionals to understand broader technological and organisational trends. I have given you a guide to the readings that describe such trends in the business and public sectors. IS professionals need to know these trends to make sense of the innovation possibilities or imperatives faced by the organisation they work for.

In addition to such descriptive knowledge, IS professionals should develop a deeper understanding of how successful innovation can be achieved. To do this, I have introduced some critical thinking about the relationship between ICT and organisational change, the requirement for managing organisational change to achieve economic benefits and the significance of analysing the human and social aspects of innovation.

Reminder of your learning outcomes

Having completed this chapter, and the Essential readings and activities, you should be able to:

- recognise IS innovation as a managed process of technology implementation and organisational change

- describe the context of IS innovation in terms of available technologies, broad socio-economic trends, and organisational trends

- describe the main categories of ICT comprising contemporary information systems

- describe the main trends in the external environment of business organisations

- describe the main trends in the internal environment of business organisations

- describe the main trends of reform of public sector organisations

- describe the main benefits associated with IS innovation

- critically discuss the relationship between ICT and organisational change

- explain why investment in ICT does not necessarily achieve economic performance benefits

- recognise the potentially undesirable effects of ICT innovation
- appreciate the significance of considering the social aspects and human needs of IS innovation.

Sample examination questions

1. Outline the main benefits a business firm may expect to gain from introducing new ICT. Critically discuss the reasons why the introduction of ICT might not result in expected benefits.

2. Outline the main stages of e-government and the organisational change required to achieve them.

3. Critically discuss the capacity of ICT to empower consumers.

Notes

Chapter 3: Forming the information systems development project

Learning outcomes

Having completed this chapter, and the Essential readings and activities, you should be able to:

- explain why major IS innovation works are organised as projects
- present arguments for aligning IS development projects with organisational strategy
- describe methods for developing an IS development strategy
- discuss the limitations and comparative merits of the most commonly used methods
- discuss the critiques of strategic IS development planning by alignment with organisational strategy
- describe soft systems methodology (SSM) as a method that assists organisations to identify desirable and feasible IS projects
- explain what kind of problem situations SSM is suitable for
- discuss the main concerts and principles of SSM
- identify the main stages of IS development projects.

Essential reading

Avgerou, C. and T. Cornford *Developing Information Systems: Concepts, Issues and Practice.* (Basingstoke: Macmillan, 1998) [ISBN 9780333732311] Chapter 2.

Avison, D. and G. Torkzadeh *Information Systems Project Management.* (Thousand Oaks, CA: Sage, 2009) [ISBN 9781412957021] Chapter 1.

Ciborra, C.U. 'The grassroots of IT and strategy' in C.U. Ciborra and T. Jelassi (eds) *Strategic Information Systems*. (Chichester: John Wiley, 1994) pp.3–24 [ISBN 0471941077].

McNurlin, B.C., R.H. Sprague, Jnr and T. Bui *Information Systems Management in Practice.* (New Jersey: Prentice Hall (Pearson International, 2009); eighth edition) [ISBN 9780131579514] Chapter 4.

Porter, M. and V. Millar 'How information gives you competitive advantage', *Harvard Business Review*, 63(4) 1984, pp.149–60.

Further reading

Checkland, P. *Systems Thinking Systems Practice*. (Chichester: John Wiley, 1981) [ISBN 9780471986065].

Checkland, P. and J. Scholes *Soft Systems Methodology in Action.* (Chichester: John Wiley, 1990) [ISBN 0471927686].

Ciborra, C.U. 'Deprofundis? Deconstructing the concept of strategic alignment', *Scandinavian Journal of Information Systems*, 9(1) 1997, pp.67–82.

Earl, M. *Management Strategies for Information Technology*. (New York: Prentice Hall, 1989) [ISBN 9780135516560].

Introduction

The aim of this chapter is to examine how IS innovation is organised in the form of projects and how IS projects are related to business objectives, ongoing business practice and the interests of various stakeholders.

Organisations continuously engage in information systems development work. Some of this work is directed towards improving their existing information systems. At a particular point in time, for example, they may be working out a new function on their existing web-based interface with customers, giving them the option to 'chat' about an enquiry regarding an order they have placed, and they may be adjusting their sales and accounting systems to change the tax rate that is included in the price of their products to comply with changes in relevant legislation. Such incremental information systems changes are important and, with time, amount to a major development of an organisation's overall information systems infrastructure. However, major information systems innovation is organised in the form of projects, that is, as clusters of tasks that are carefully planned and executed to meet well-defined objectives within the limits of allocated time and budget.[1] A good knowledge of what IS projects involve and how they are managed is fundamental for IS professionals.

[1] *Avison, D. and G. Torkzadeh* Information Systems Project Management. *(Thousand Oaks, CA: Sage, 2009), Chapter 1.*

The options an IS manager has for developing new systems have changed substantially over the years and therefore what an IS project involves has changed too. Thirty years ago most organisations developed their computer-based information systems by designing them to fit the information requirements of their operations and management. According to the specifications of their information needs, they bought the required hardware and telecommunications from vendors and constructed their software applications by employing teams of expert systems analysts, designers and programmers. Two major changes have happened since.

First, only a few software applications are developed from scratch for the specific requirements of an organisation by expert technical staff in-house. The development of an information system may not involve any design and programming of software, but may make use of ready-made software, which is either bought from software vendors, or acquired, from internet-based 'free and open source' software development communities. Even if purpose-built software is needed, it is very likely that component development will be outsourced, that is, will be contracted to specialist software firms. Recently, it has become increasingly common to get software from an online service provider. To cover all these various options or 'sources' of the software component of information systems innovation, we should, more accurately, talk about software 'sourcing', rather than software 'development'.

Secondly, the development of information systems does not aim just to fit existing work processes. Instead, it involves a substantial effort to redesign the organisational processes – the 'business processes', in the jargon of the professionals. An information systems development project involves two parallel streams of effort: the design of organisational processes; and the development of IT artefacts, such as software and data repositories, that provide the information communication and processing support for these organisational processes.

In this and the following three chapters I will take you through the information systems development project process and guide you to relevant readings. Although only a small proportion of IS development projects today involve the construction of software for the specific

requirements of the information system under development, I will consider this option of sourcing and, in this and the next chapter, elaborate on what it entails. This is because this option involves the complete range of technical and non-technical tasks of information system development and you need to understand it to make sense of the other options, which I will introduce in Chapter 5. First, though, we need to understand what has to be managed in an IS development project.

The multiple concerns of the information systems development project

The information systems development project should be understood as the parallel construction and introduction in the operations of an organisation of many different technical artefacts and organisational changes. In general, the development process is made up of developing and implementing the following:

- **A software application**. Central position in the information systems life cycle model is given to software development. Indeed, most descriptions of information systems projects concentrate on this. The construction of software is a complex technical task and, as you will see in the next chapter, the most widely-used model of IS development, the life cycle model, accommodates several techniques for getting it right. But this is an impoverished view of information systems development. Software development is not equivalent to the development of an information system. Even if an information systems development project uses ready-made software, bought as a package, there is plenty of other work left for the project to do. In such cases, the life cycle model, in a modified form, continues to be useful for organising the development of various technology development components and organisational change tasks from the conception of a new information system until it is in operation. I will explain this in the next chapter.

- **Hardware configuration**. The development of information systems, that is, systems processing information in business firms and government organisations, rarely requires the construction of new hardware. However, hardware components must be carefully specified according to the requirements of the particular information system under development. This is often done in parallel with a market search to find out what computer products are available, their prices and their performance.

- **Telecommunications network**. An important feature of information systems is the connectivity they support to allow users to communicate within and across an organisation's boundaries. This involves developing a network infrastructure within an organisation as well as the use of telecommunications services such as voice mail, mobile voice mail, broadband, wireless email and data services. For example, a travel agent developing a new system for customer support will need to give its customers the option to communicate with them from all over the world through various means of communication, such as the telephone, internet, SMS and social networking platforms, such as Twitter or Facebook. An important aspect of designing an organisation's network and choosing telecommunication services vendors for the purposes of a new information system is 'interoperability', which means the ability of different technologies with different operating systems to exchange information and work together. In the case of a travel agent's customer support system, they will need

to handle communication with and through PCs, laptops, handheld devices from different manufacturers with different operating systems, and Voice-over-IP (internet telephony), such as Skype.

- **Change management.** One of the most fundamental lessons you need to understand as a student of information systems and later as a professional is that the implementation of new technology-based information systems leads to 'modern' organisational features, such as 'leaner', more efficient production or customer-friendly services only if it is accompanied by sustained effort by the management of the organisation for re-organisation. New work arrangements will almost certainly need to be designed, and employees will need to be trained accordingly. The redesign of work and business processes is so important that it is likely to be a parallel project in its own right. When it is not, working out necessary organisational change has to be included in the IS development project.

- **Facilities for changing over from the existing information system to the new information-handling procedures**. It may be necessary to develop special applications to convert existing data records to a form amenable to the new information system's hardware and software. Also, special publications, videos and training material may need to be developed to inform employees and customers about the new system and to introduce them to using it.

- **Security and integrity arrangements.** These need to be designed and incorporated both into the technical components software, hardware, telecommunications – as well as in the work procedures of the organisation. It is necessary to design backup and recovery procedures to cope with the risk of accidents or fraudulent actions. A backup system will allow the organisation to continue functioning in case any component of the new information system breaks down or has, for some reason, to be abandoned. It is particularly important to plan and develop backup procedures which will take over the operations from the computer and telecommunications systems if they break down from power failure, software errors or sabotage. A backup system may be manual or may run on another computer system.

- **Arrangements for the effective management of the resulting system**. The organisation must be able to continue to manage effectively its information and information-processing resources after the new system begins operating. I will discuss information systems management extensively in Chapter 6 as a process broader than systems development. Nevertheless, you should understand that the development of new information systems involves management decisions and actions to make sure that the new system is sustainable and that its use can be effectively supported and controlled within the overall management of the organisation. For example, it is important to plan for and secure the necessary skills for its maintenance and to make sure there are clear responsibilities for data administration.

Pre-project initiation: identifying a portfolio of information systems development projects

The question of how we decide to start developing a new information system may seem to have obvious answers. Consider the following examples of various pressures or opportunities that seem to present clear needs for an information system development project:

- **Conforming with services and procedures that have become industry standard in the organisation's sector**. For example, the introduction of social networking services is becoming a common feature in the travel industry. Customers of online travel agents can read travellers' comments and ratings on the quality of holiday resorts, hotels, etc, and can contribute their own comments.

- **Pressure from external sources**. These include business partners such as suppliers or customers and mandatory requirements springing from changes in regulations and changes in the law or its interpretation.

- **Coping with a problem**, such as overcoming the scarcity of skilled personnel for certain jobs by introducing computer support for helping people do these jobs.

- **Uncertainty about the capacity of existing information systems to cope with continuing adjustments or with external events**. Such was the case in the late '90s with the worries about the 'millennium bug' – the fear that program code of old legacy systems would crash with the change of date from 19XX to 20XX. This led to many projects to replace legacy systems.

- **Exploiting opportunities offered by advances in new technology**, such as introducing handheld devices that link to the organisational databases and perform transactions remotely to support the work of insurance salespeople visiting customers.

Yet, there are two problems with initiating projects by spotting pressures and opportunities. The first is that an organisation may be swamped by requests for IS projects, spend a great deal of money, and yet the innovative systems may not serve its business objectives well. What is needed, IS research has suggested, is systematically linking IS innovation projects with business strategy. The second problem is that pressures and opportunities – and even business objectives – may not be clear enough to suggest unambiguously the need for a specific information system. There may be conflicting views among stakeholders about the desirability of launching an IS innovation project. In such cases, additional effort is required to reach a decision about the desirability and feasibility of an IS project. I explore each of these efforts, strategic planning and structuring the decision for a new project against vague or conflicting views in the following sections.

Activity

Find a local firm, or perhaps a local authority, that is developing an information system or has recently completed such a project. From discussions with the staff of the organisation find out:

- How they decided to develop a new IS.

- Whose decision was it?

- What triggered that decision?

- Was there general agreement about the necessity and the objectives of the system?

- Did anybody express any doubts?

Aligning the IS project with organisational strategy

A major concern in IS research and practice has been that too often information systems projects have only a minor or no impact on overall business success. From a business point of view many IS projects are seen

as a waste of valuable financial resources. To overcome this problem it has increasingly become imperative to link plans for IS development projects with business objectives. This is known as 'business and IT alignment'. Organisations must carefully work out business strategies and then work out plans for information systems aligned with those business plans. Avison and Torkzadeh (2009) Chapter 2 explain the rationale of aligning IS projects with organisational goals.[2] The basis for this alignment is the organisation's strategic plan, which they see as 'a *road map* that suggests directions for resources and activities for the future' (p.42), answering three fundamental questions:

1. Where are we now?

2. Where do we want to be?

3. How can we get there?

It is useful to distinguish between strategic and operational business objectives. Strategic objectives should state overall aims, such as increasing efficiency and productivity, improving customer services, entering a new market and decentralising the organisational structure. Operational objectives derive from strategic objectives and are much more specific in terms of action and limited in timespan. For example, the strategic objective to increase efficiency may be translated to the operational objective to cut down administration costs and this may lead to a specific effort to redesign some aspects of the work of a department as well as appropriate information communication and procedures. Note that McNurlin et al. (2009) p.133 also include 'tactical planning' as an intermediate category of planning for resource allocation and project selection. The main lessons you need to learn from the literature about this discussion is that planning for IS projects should seek to identify and allocate resources and initiate action for IS innovation that contributes to an organisation's objectives. Planning takes place at several levels of management; starting from the setting of overall strategic business and IS innovation objectives by the executives and senior managers, and gradually working out more specific action plans for projects involving middle managers and operations staff.

The organisational strategic plans, as well as the more specific tactical and operational plans, help managers to identify projects that support organisational goals and objectives. In the light of an organisational strategy, IS managers can develop an overall plan for a portfolio of information systems development projects, taking a long-term perspective and avoiding duplication of effort by individual departments and redundancy of information resources. They can develop criteria for prioritising projects and measuring their success. If somebody proposes the development of a new IS, to introduce, for example, some new technology that has become available, the merits of the proposal should be judged in relation to business strategy. Does the proposed system help to realise business objectives?

Such a planning exercise is essential to win support from top management, which is considered important for project success[3]. It is also important because it identifies how big a change a proposed information system requires in terms of business processes and people's jobs. In this way a project manager can align a systems development project with other projects pursuing business process redesign and can prepare employees for new jobs by giving them early information about changes to their jobs and appropriate training.

[2] *Read the appendix to Chapter 2 of Avison and Torkzadeh (2009).*

[3] *Read the appendix to Chapter 2 of Avison and Torkzadeh (2009).*

This idea of aligning an organisation's overall business strategy with a portfolio of information systems and technologies is clearly depicted in 'Traditional Strategy Making' in McNurlin et al. (2009), Figure 4.2, p.136.

Note how the arrow on the left hand side of the diagram indicates three steps of progression:

1. Where is the business going and why?

2. What is required?

3. How can it be delivered?

We must ask, however, whether this approach misses opportunities for strategic change that ICT may enable. The idea that business strategy should precede information systems plans became widely accepted in the 1980s. The problem with this idea is that it risks wasting opportunities for innovation and new business that information systems developments may provide. Information systems developments tend to be reactive to business strategies, missing the possibility of proactive information systems-based business success. If an organisation decides its IS projects on the basis of thinking how to serve its **existing business strategy**, it may miss new strategic possibilities of new ICT. It may never form visions for new, IT-enabled business models. In other words, instead of separating the planning of business strategy from IS innovation, a more effective alignment of IT and business objectives is achieved by considering business strategy and IS innovation simultaneously at all levels of planning, and increasingly this is what happens. Executives responsible for IS and IT – the CIO and CTO – should be involved in developing business strategy. Think about some of the most successful companies whose business crucially depends on continuous IS innovation, such as Amazon and Google. In these highly successful companies, as well as in many other organisations that do business electronically (e-business, e-commerce, e-government) planning for their business strategy is inseparable from planning IS innovation.

IS planning

Various methods have been proposed and used to help managers and IS professionals spot the strategic opportunities offered by new ICTs and align IS development projects to business strategies and judge the merits of IS project proposals. McNurlin et al. (2009) outline eight planning techniques on pp.145–69 which you must read and fully understand.

Some of these techniques were first developed in the 1970s and '80s, when many organisations introduced their first systems based on mainframes and stand-alone personal computers. They were useful tools for practitioners and continue to be used, particularly by consultants who have to make sense of a client's business and IS quickly and to communicate with them in a simple and clear way. This is the case with the methods of Critical Success Factors (CSF), and scenario planning, which are generic techniques that prompt managers to structure their thinking about information requirements that will be crucial for the future survival and success of their various business areas.

Some old techniques have been extended over the years to address the planning needs of organisations that are already equipped with a plethora of hardware and software applications and are preoccupied with the challenges of internet-based systems. For example, Nolan's model of stages of growth was originally devised to help managers balance the extent to which they encouraged projects that diffused computer-based information systems and databases with the control they had to exert to contain

expenditure and achieve standardisation. As McNurlin et al. (2009) Figure 4-5 on p.146 shows, this model has been extended to help managers map their position regarding proliferation of innovation and required level of control for internet-based projects.

Other techniques have been modified more substantially to address the planning needs for the current technology and business context, which we outlined in Chapter 2. This is the case with Michael Porter's competitive forces model[4] and value chain analysis.

Porter's model suggests five competitive forces that affect an organisation:

- the existing competitors in an industry

- the potential new entrants into an industry

- substitute products and services that customers might use

- suppliers of raw material and inputs

- consumers of products or services.

These five competitive forces define the context within which business policy and information systems plans have to deliver value. Thus, Porter's model takes its starting point from an analysis that sets business objectives and then identifies IS projects that can serve these objectives. It misses the opportunities for new radically different ways of altering the game of competition, such as Google's business model that provides its primary products – information – for free, and earning income from advertising. Thus we can see the three emerging forces model by Downes, introduced by McNurlin et al. (2009), pp.151–52, as an extension of Porter's model to direct managers' attention to addressing the strategic opportunities provided by digitalisation, globalisation and deregulation.

Porter's 'value chain' analysis has also been extended to address the needs and opportunities of the internet era. In its original version, the value change model identified the sequence of key activities that a firm performs to deliver a product or service that is valued by the customer. This concept proved useful for information systems planning, because it provides a framework to relate information systems to the key activities of the organisation and their linkages. More recently, McNurlin et al. (2009) suggest, this analysis has been extended with techniques helping managers to consider 'virtual value chains'. Adding value by gathering, organising, selecting, synchronising and distributing information (which is what internet-based information systems can do) needs to be considered with regard to global marketplaces, because with internet-based information systems organisations can overcome physical restrictions of space. Thinking in terms of virtual value chains, organisations can make physical operations, no matter where they are located, visible through systems that provide detailed information of their production processes. They can then start managing them without the need to have all production and management activities being physically present at the same place, that is, virtually, meaning that their geographic location is not important. The development of information systems that allow organisations to manage their activities remotely allows them to rethink what the most effective ways of offering value services to their customers are and whether they can introduce new services and products.

McNurlin et al. (2009) also outline two techniques – e-business value matrix and linkage analysis planning – that are designed to address the planning needs of the contemporary IS innovation setting. The e-business value matrix, while rooted in the same idea of exploring the possibility of adding value through better ways of collecting and handling information,

[4] Porter, M. and V. Millar 'How information gives you competitive advantage', Harvard Business Review, *63(4)* 1984, pp.149–60.

encourages the search for innovative IS projects that exploit the potential of the internet. The result of this technique is a portfolio of projects, which need to be assessed in terms of their degree of 'newness' and criticality for the organisation. The technique suggests four categories for classifying projects of the portfolio:

- Relatively short projects (three-to-six months) aiming to deliver systems supporting fundamentally new ways of working in narrow areas of work, which are not very risky and aim at localised benefits, mainly cost savings.

- Projects aiming to promote operational excellence, that is, to improve some aspect of an organisation's performance, such as management control or customer satisfaction, and require not only the introduction of some new ICT tools, but also re-engineering of work processes. They are somewhat expensive, long (about 12 months) and risky, and have high visibility. Such projects should not be experimental and use untested new technology.

- Projects experimenting with new technologies and ways of organising in specific, limited areas of activities; these projects should be understood as having a high risk of failure, but are important to explore innovaetion possibilities for staying ahead of the competition.

- High risk and highly innovative large-scale projects that may make a breakthrough for an organisation. Obviously such projects cannot be decided frivolously because they can make or break a company. Their decisions will need to involve top management and require careful consideration of the market context of the organisation and the technologies involved in the innovation.

Finally, the linkage analysis planning technique helps managers to realise that their business extends beyond their organisational boundaries and devise a plan for projects aiming at developing electronic channels of communication and collaboration with the other organisations they do business with. The starting assumption of this technique is that modern organisations are not isolated but meshed in relationships with suppliers, buyers and strategic partners. Therefore, successful business firms control the electronic interconnections of such inter-organisational business. It therefore guides managers of a company to identify who are the most important organisations they do business with and what is their power to determine threats and opportunities for the company. Managers should trace an 'extended enterprise diagram', which depicts their supply chain and value added network that includes the organisations they do business with. The extended enterprise map can then be used to identify what inter-organisational electronic channels are of strategic importance for the company and take action to make sure that they have adequate information systems in place.

Activity

Do Exercise 3 from Chapter 4 of McNurlin et al. (2009), p.168: 'Create a simple information linkage analysis chart of your current personal relationships. Put yourself in the middle box and each relationship in its own box around you, with a line from you to each of them. Who has the power in each link? How much might that power shift in the future? Which is the most important relationship to you? How could you make it more win-win?'

Critical reflections

Three routes for IS planning

You will have realised that IS planning is a complex process that identifies areas of IS innovation that will contribute, either modestly or radically, to a future success of an organisation. Clearly no single method or technique covers all relevant aspects for the successful development of an IS infrastructure to provide for future organisational needs. Drawing from Earl (1989) we can distinguish three different planning routes, each supported by different methods:

1. The first route aims at aligning information systems objectives with business strategy. The planning process begins with the determination of significant business concerns and proceeds to specify appropriate information systems to address them. The CSF method and Porter's models and value chain analysis, as well as their recent extensions, are suitable for this route.

2. The second route aims at linking plans for future information systems development with the current information systems infrastructure capacity of the organisation, which is particularly important to avoid making unrealistic plans. Nolan's stages of growth method can be used to do this.

3. The third route allows for pro-active thinking, giving the opportunity to raise innovative ideas that may lead to new business strategies. E-business value matrix and linkage analysis planning encourage such thinking for technology-driven innovation.

Reconciling the dynamic nature of IS innovation with planning

Belief in methodical information systems planning, which has prevailed in the literature in the last decade, has not gone unchallenged. There are many who doubt that strategic decisions can be structured through methodical practices. They voice concern that emphasis on method and form misdirects organisations into stifling their truly creative human resources. Information systems planning methods, they claim, at best can lead following the leaders of a business sector, but they cannot generate the innovation that is needed to become a leader. McNurlin et al. (2009), while suggesting that IS planning is good practice, point out (at the beginning of Chapter 4) that detailed long-term planning is unlikely to be useful in the contemporary fast-changing technological and business world. A closer link between planning and action is required. Instead, they suggest a 'sense-and respond' planning approach, which requires managers to be alert and spot new opportunities in business and technology and try quick responses with experimental projects. However, such an approach, which will lead to many different IS innovation strategies being tested simultaneously, may create confusion and waste. The various experimental plans should still need to be placed within an overall business and innovation strategy.

Tinkering, improvisation, care and cultivation, rather than planning

A more radical critique of IS planning is presented by Ciborra (1994), who rejects the notion of business and IT strategic alignment. He argues that the notion of strategic alignment, which is heavy in planning, misrepresents the way organisations go about IS innovation. Instead, he highlights the importance of those decisions and actions that are not

formally or rationally planned, but are taken spontaneously, on the spur of the moment, as an actor experiences the situation arising from the progress of an innovation. Ciborra advises managers to rely more on tinkering and improvisation and do little formal planning. Improvisation relies on an actor's past experience and ability to comprehend the situation and spontaneously deploy relevant competent behaviour. His critique on the emphasis that has been given to formal, methodical, planned action and his efforts to shift emphasis towards improvisation is based on a 'phenomenological' perspective of human behaviour. Roughly speaking, this is a philosophical concept regarding the way people come to understand and act in the world that emphasises our ability to make sense of the world on the basis of everyday experience rather than abstract, rational thinking. Rather than trying to discover theories and models to capture the way people and organisations should behave and then expect that they should be followed to achieve expected organisational outcomes, Ciborra suggests that IS managers should try to understand how people behave in the particular situations they are faced with. This approach emphasises the experience people have in the environment they are familiar with and the way they have learned to perceive and respond to their immediate environment.

From such a perspective, Ciborra argues, the general models for rationally calculated action and methodical organisation of systems development rarely work. Instead, IS innovation involves a great deal of spontaneous action and idiosyncratic decision-making. Rather than having pre-conceived views of successful outcomes and expecting managers to control activities and supervise methodical tasks to achieve them, organisations should recognise that innovation is a process that addresses the unknown and requires ability to respond to unforeseen circumstances. It also requires empathy and caring for the technologies that are put together to form new information systems. This is a very different attitude from that of pre-determining objectives, and subsequently developing technical mechanisms to fulfil them through formal thinking and activities. Notice the contrast in the language used by Ciborra (1997). Rather than talking about planning, correct formal design and successfully meeting business objectives, he suggests that we think in terms of 'caring', 'hospitality' and 'cultivation' of technology to construct infrastructures that assist people to communicate, make sense of what they do and act effectively.

Summary

We have looked at three views on how organisations should fit IS innovation projects with a business. The first advocates the development of an IS project plan carefully calculated to contribute to the objectives of the organisation's business strategy. The second moderates this view by noticing that a business strategy is dynamic, continuously changing in the contemporary global economic context and advocates shorter planning horizons and an attitude of experimentation. The third view suggests that alignment of business and its IT happens in action through everyday experience and user involvement in the shaping of technologies in the workplace, and that this goes with continuous management commitment to achieve a better work environment and successful business.

Deciding systemically desirable and feasible IS projects in conditions of uncertainty

In many cases the beginning of a systems development project is not so straightforward as the IS planning literature suggests. It may not be obvious that an organisational problem, such as the inadequate performance of a particular department will be dealt with by a new information system, or there may be conflicting opinions about the extent to which a new information system may serve business objectives. Even if it is clear that there is an information system problem, there may be concerns that the problem extends to other aspects of the organisation as well. Unless the problem is explored and all necessary actions are taken, the organisation runs the risk of wasting money on a project which not only will not reap the expected benefits but will also misdirect the organisation's efforts to overcome the problem.

In such cases it is necessary to carry out a study of the problem – or some perceived opportunity – to get a broad view of the organisation and establish the potential benefits or risks of developing a new information system. More specifically, such a study will shed light on what benefits a new information system is going to offer to the organisation; it will clarify doubts and aim to resolve conflicts about the desirability of the proposed changes; and it will indicate what action other than developing an information system is required before, or in parallel with, the information system development project.

The soft systems methodology for the identification of organisational problems

One way for investigating a proposal for an information systems project whose benefits or feasibility are not absolutely clear is the soft systems methodology (SSM). The methodology was developed by Peter Checkland and described in detail in his book *Systems Thinking, Systems Practice*, written in the early 1980s.[5] Since then, several other books have elaborated on the methodology, stressing particular aspects of it and illustrating the way it can be applied with examples and extensive case studies.[6]

At one level, the description of the methodology is quite simple, guiding the analyst to make sense of what is happening in the organisation and to assist the project team to take effective decisions by following seven distinct steps. However, the main value of the methodology is not the seven-step model it outlines. The most important thing is to understand the ideas on which the methodology relies. Indeed SSM is one of the most successful efforts to systematise the investigation of systems that are not amenable to structured, mathematically-defined behaviour, such as human organisations. Most 'hard' systems models and theories which have been developed in natural sciences and engineering are inappropriate for the messy world of human activities within organisations.

The methodology has not been developed specifically to investigate information systems changes. It is a way to intervene in organisations, to explore problematic situations they are faced with, and drive towards decisions on actions which will alleviate a problem. Nevertheless, SSM has proved very useful for examining information systems problems. Particularly relevant are the following features of the methodology:

- SSM addresses vague problematic situations rather than well-defined 'problems' and aims at actions that will improve the 'situation', rather

[5] Checkland, P. Systems Thinking, Systems Practice. (Chichester: Wiley, 1999).

[6] For the purposes of the course you can read Avgerou and Cornford (1998), Chapter 2, which is available in the electronic study pack.

than optimum solutions to the 'problem'. That is why SSM proves useful when the desirability of developing an information system is not clear.

- SSM guides the analyst to consider the different points of view that different parts of the organisation have, their different perceptions of the problem, different concerns, and the different actions that people are willing to take. Thus, SSM helps analysts understand any conflicting perceptions about the potential value of a proposed information system and provides them with a methodical way to deal with them. This is a particularly useful feature, because conflict and differences of opinions among their 'clients' is a major difficulty for analysts. Often they are overwhelmed by the politics of an organisation and tend to ignore unfavourable attitudes that people may have towards a proposed system or comments they make about other changes they wish to see in the organisation, with detrimental effects on the long-term success of a system's implementation.

- SSM is not restricted to a particular systems theory or model; rather it advises the analyst to search for theories relevant to the problem in order to design an appropriate human activity model. This provides flexibility in addressing information systems issues. The significant aspect of SSM is not the application of a systems theory, but the adoption of a way of thinking which is capable of coping with complexity in the unstructured form of human organisations.

- SSM aims at reaching decisions for actions which are 'systemically' desirable and 'organisationally' feasible. This means that the analyst should seek to propose actions which will allow the organisation to function well as a system; however, they should also make sure that the actions that will be decided on are feasible for the organisation. In other words, SSM acknowledges the significance of social and organisational factors and drives towards effective action. It does this by seeking to reach a consensus decision, by involving interested participants in decision-making. SSM is particularly suitable for starting the information systems development process in cases where the social and organisational elements are important.

- SSM does not restrict the investigation to information-handling, but addresses broader issues of the organisational context of a proposed information system. It is, therefore, possible to reach decisions about organisational change rather than just about the development of an information system.

It is easy to get enthusiastic about SSM, particularly as it promises to overcome the restrictive rationale of 'hard' methods, which ignore the social and organisational dimensions of information systems and which often lead to unusable technical systems. However, it is necessary to be clear about the scope of SSM and to understand that, in many cases, SSM is either not needed, or not applicable. If a proposed information system project does not relate to an unclear problem, and there is no doubt about its expected benefits, an investigation with SSM is probably unnecessary. But, even in cases where such an investigation is needed, it may not be possible to apply SSM. For example, if the organisation has an authoritarian management style, which does not tolerate open discussion involving participants with diverse opinions, the analysts' intervention is unlikely to be welcome. In many cases trying to achieve a consensus decision is not acceptable to everyone participating in the discussions. Cultural differences such as these may make SSM inappropriate, and the analyst should seek a different approach to establish the desirability and the feasibility of a proposed information system.

Activity

If you have found an information system idea or proposal which is not clear or which does not seem to get full approval by all the people you have talked to in the organisation you have approached, try to apply some of the ideas of SSM. It is unlikely that you will be able to do a full investigation and get practical results. SSM is particularly difficult to master and requires considerable experience to build the necessary skills. Nevertheless, for the purposes of this course, you can try to form a 'rich picture' of the problem, write some relevant root definitions and see if they lead you to any better understanding of the situation. Consider, in particular, the information systems problems you have come across and think about the different ways in which they might be seen. Try to think of relevant activity models and discuss their validity with the staff from the organisation. If your study leads you to make any suggestions as to actions for the organisation to take, either related to information systems development or other changes, discuss them with the staff to see whether they are considered feasible or not.

The staged tasks of an information systems project

Let us assume that an organisation's IS planning has produced a portfolio of prioritised IS projects, and exercises such as SSM have clarified their desirability and feasibility. Each project will then have to be carried out and managed. The activities of information systems projects are usually arranged in stages. I will follow the model in Avison and Torkzadeh (2009) of an IS development project that involves, in linear succession, five stages:

- Initiation
- Planning
- Developing
- Implementing
- Closing.

This five-stage model reflects, in a condensed version, the various depictions of information systems development as a life cycle, which has its origin in the software engineering life cycle. Compare, for example, this simplified IS project management model in Avison and Torkzadeh (2009), p.16, with the stages model of a systems development methodology on p.66 and the software development life cycle on p.78 of the same book, and with the 'waterfall' development life cycle in McNurlin et al. (2009), p.324. A slightly more complicated picture is the 'spiral model' of software development on p.76 of Avison and Torkzadeh. Can you spot the similarities? The names and numbers of the stages vary, but they all start by identifying what kind of system is to be developed and then they proceed by breaking down the work into more specific detailed tasks until the system is ready and is introduced in the organisation and thus closure is achieved. In the case of software development the system is a software application; in the case of information system it is a set of interrelated artefacts and organisational changes. The arrows that link these stages are one-directional, suggesting that the systems development process – and the project set up to manage it – only goes forward, from deciding what needs to be done, towards executing in a linear fashion the tasks needed, till the system is in operation.

This is a gross simplification of a complex set of interrelated tasks. I will make detailed critical comments of the life cycle model in the next chapter. Nevertheless, I will follow this model throughout this subject guide as a rational basis for identifying connected multiple tasks, keeping in mind

that it is a crude approximation of what actually happens in practice, but helps us understand the kind of activities that an IS project involves.

An IS project is made up of two parallel streams of work: the technical tasks for developing and implementing the various IS components that I have identified above (that is, software, hardware, telecommunications, redesigned business processes, changeover facilities, security, operations management arrangements) and the management activities that steer all the technical tasks towards successful completion and operation of a functional IS. The main concern of the systems development work is to construct and introduce technically robust technology artefacts alongside effective organisational arrangements. The main concern of project management is to allocate the necessary resources and coordinate the technology construction and organisational change tasks. These streams of work are closely interrelated.

The following table shows a rough correspondence of the project management and technical tasks of the IS life cycle.

IS development life cycle stages	Project management stages
Information requirements analysis Feasibility study	Initiating
	Planning
Systems analysis Systems design and programming	Developing
Implementation	Implementation
Evaluation Maintenance arrangements	Closing

In Chapter 4 I will take you through the tasks of the first column, IS development, and in Chapter 6 I will discuss what the second column, IS project management involves.

Reminder of your learning outcomes

Having completed this chapter, and the Essential readings and activities, you should be able to:

• explain why major IS innovation works are organised as projects

• present arguments for aligning IS development projects with organisational strategy

• describe methods for developing an IS development strategy

• discuss the limitations and comparative merits of the most commonly used methods

• discuss the critiques of strategic IS development planning by alignment with organisational strategy

• describe soft systems methodology (SSM) as a method that assists organisations to identify desirable and feasible IS projects

• explain what kind of problem situations SSM is suitable for

• discuss the main concerts and principles of SSM

• identify the main stages of IS development projects.

Sample examination questions

1. Outline Porter's model of five competitive forces. Describe the three additional forces that Downes argues need to be analysed in IS planning. To what extent, do you think, these planning techniques are adequate to form a strategy for IS projects?

2. Explain the main principles of SSM. Assume you are newly appointed to launch and manage a new IS development project. Would you use SSM? If so what would you try to achieve with this method?