eBUSINESS
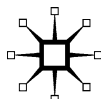
PAUL BEYNON-DAVIES

SECOND EDITION

eBusiness

eBusiness

2nd edition

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About the author

Paul Beynon-Davies is Professor of Organisational Informatics at Cardiff Business School, Cardiff University. He received his BSc in economics and social science and PhD in computing from University of Wales College, Cardiff. Before taking up an academic post he worked for several years in the informatics industry in the United Kingdom in both the public and private sectors. He still regularly acts as a consultant to public and private sector organisations and has been consistently rated one of the top information systems scholars worldwide.

He has published widely in the field of information systems and ICT and has written 12 books, including *Business Information Systems*, *Database Systems* and *Information Systems Development*. He has also published more than 70 academic papers, on such topics as the foundations of information systems, electronic business, electronic government, information systems planning, information systems development, database development and artificial intelligence.

Paul Beynon-Davies has engaged in a number of government-funded projects related to the impact of ICT in the economic, social and political spheres. He was involved in an evaluation of electronic government in Wales and was seconded part-time to the National Assembly for Wales (NAfW) as an evaluator of its Cymru-ar-Lein/Information Age strategy for Wales. From 2006 to 2008 he was director of the eCommerce Innovation Centre at Cardiff University, which also included the Broadband Observatory for Wales.

His research work has explored some of the foundations of informatics. This involves an attempt to build a more coherent and unified conception of Informatics as an inter-disciplinary area focused on the accomplishment of organisation through the entanglement of signs, patterns and systems. A summary of this work to date has been published by Palgrave Macmillan in the book *Significance: Exploring the Nature of Information, Systems and Technology*.

Preface to 2nd edition

Positioning

There are many texts on eBusiness or eCommerce. However, one of the reasons for writing the first edition of this book and now publishing a completely revised second edition was the belief that there continue to be a number of deficiencies with offerings in this area. The vast majority of texts on eBusiness are US in origin and naturally take the point of view of the North American continent. Many also tend to focus solely on the business issues and fail to correctly locate the technical issues within the business context. A large proportion of those texts that do focus on the interaction of ICT and organisations tend to be directed towards consultancy rather than providing academic balance. As such they have been more interested in 'selling' various aspects of the phenomenon of electronic business than in providing a systematic survey of the field, in the sense of identifying clear patterns and synergy with established practice. The available literature in the way of academic textbooks tends to be structured in terms of an accumulation of topics rather than a theory-driven form of presentation. Many textbooks also seem to multiply the number of concepts needed to understand and manage the phenomenon of eBusiness. Finally, there is a primary focus on the private sector in the existing literature, but the dynamics of eBusiness are not exclusive to the commercial enterprise. The application and exploitation of ICT for organisational change is equally relevant to the public sector and more recently to the voluntary sector organisation or social enterprise.

Our text continues to be clearly positioned in terms of these perceived limitations. It offers a worldwide perspective on eBusiness: many of the examples cited are taken from the UK and European experience of this phenomenon as well as from the US experience. From the start we position eBusiness as a socio-technical phenomenon which can be understood only through a balanced perspective: the appropriate application of technology within organisation. This book therefore provides a balanced and integrated account of business and technical issues.

We build an account of eBusiness from first principles, considering first the inter-relationship between activity, communication and representation and how this helps form organisation. This provides the proper context for explaining the modern application of ICT in business and understanding the value of ICT to organisation.

The approach taken in this book has been field-tested in a number of advisory and consultancy projects undertaken by the author and is constructed as a holistic account of the phenomenon. It provides a rounded focus on the application of eBusiness principles in the private, public and voluntary sectors. This means we cover the relevance of principles of eBusiness to all forms of organisation, including the modernisation of public sector services. We have also attempted to use the principle of Occam's razor in this text. In other words, we have attempted to use only sufficient concepts for the tasks of understanding and explaining the phenomenon of eBusiness. Three particular concepts we take to be foundational – those of sign, pattern and system. The idea of system drives the discussion of both theory and practice in the text. But we explain how the facets of a sign help stitch together patterns of activity, communication and representation in organisations. It is within such organisational patterns that eBusiness takes its rightful place. Finally, this text provides a systematic account of the field structured around a model of the eBusiness domain presented in the opening chapter and elaborated upon in various parts of the book. Clear linkage is also made to a number of my other texts published by Palgrave Macmillan – *Business Information Systems*, *Database Systems* and the more recent *Significance: Exploring the Nature of Information, Systems and Technology*.

Changes for the second edition

Most of the core content has transferred into the new edition from the first edition. However, a large number of improvements have been made in response to feedback from lecturers, students and the business and technology communities. The structure has been modified significantly to better organise the key discussion. Material has been combined into larger chapters which build to form a conception of eBusiness from first principles. Discussion of the growing body of literature exploring the theory behind eBusiness is expanded and better integrated into the flow of presentation. A number of new topics are included, such as mobile commerce, electronic government and cloud computing. Certain chapters have also been significantly updated with new material. Finally, the case material in the book has been extended, updated and better organised and a much greater range of pedagogical resources are included at the end of each chapter, such as a review test, exercises, projects, a critical reflection section and an exploration of case material presented at the end of the book.

Acknowledgements

Message to students

This book covers essential core material in the area of eBusiness. My aim in writing this book has been to create a coherent path through the subject which addresses some of the needs I have identified during more than three decades of experience in the area. Care has been taken to ensure that only material that is critical for the business student is included. Therefore, some material which you might find in other texts has been excluded to provide you with a more coherent and more relevant exploration of the subject.

Many textbooks on eBusiness consist of a collection of interesting but disconnected topics. In this manner, eBusiness is portrayed as something different from everyday business – sometimes radically different from conventional business. This book challenges that viewpoint. We consider eBusiness as modern business and assemble material to portray this topic as an integrated and seamless web of ICT application in organisations. This book therefore makes it easier for you to make sense of the subject as a whole. It also makes it easier for you to see how different elements of the subject inter-relate.

We provide balanced coverage of both theory and practice in this text. The aim is to use precise definitions of a number of foundation concepts to provide an understanding of the place of information, information systems and ICT within business. Such understanding then enables us to identify and explain a number of key lessons of use to professionals working in all forms of organisation.

So what you will get from reading this book is a *rounded* but *grounded* conception of this important area. The book will equip you with knowledge which will enable you to better perform as a business professional in the modern, complex organisational world.

Creativity involves, in the psychologist Edward De Bono's words, 'breaking out of established patterns in order to look at things in a different way'. Most of all this book is designed to get you to think differently: not only about organisations of all forms, but particularly about the place of technology within such organisations. After all, thinking differently is a necessary precondition for any successful innovation.

Message to lecturers

Audience

The material in this book is intended to impart a balanced, holistic introduction to the phenomenon of eBusiness. As such, it covers the key business and technical issues associated with electronic business and electronic commerce. The material is intended to act as a foundation for further investigation in eBusiness, information systems or information and communication technology. As a core text the likely audience will be undergraduates in business-related subjects, information systems (IS) or computing. As a reference text its audience is likely to be MSc or MA students taking an IS course or a substantial number of IS modules on an MBA or related programme. For all such students, this text will provide intellectual structure to the apparent but important chaos that is modern eBusiness.

Innovative approach

This book takes the innovative approach of building an account of eBusiness from first principles. To do this we use theory from a range of areas such as systemics and semiotics, and bring these ideas together to demonstrate how eBusiness is not just about the application of ICT within and between organisations: it is continuously created in the dynamic relationship between data, information, decision-making and activity in organisations. Indeed, we shall demonstrate how organisation is produced and re-produced from this interaction. This innovative approach we think serves to better place eBusiness in its proper context: it hopefully provides new life to demonstrating the centrality of eBusiness issues to modern business.

Ancillary material

A website has been produced to accompany the book and can be accessed at: www.palgrave.com/business/ebusiness2. Ancillary material includes a teaching guide and a number of PowerPoint presentations containing figures from the book. From this website instructors can also download an innovative ancillary database which provides one centralised repository for all additional material associated with the text. This database includes data about:

- Potential modules
- Potential lectures
- Revision questions
- Projects
- Exercises
- Exam questions
- Cases
- Web links
- Readings
- Book sections
- References to additional content from previous books by the author that is available on the website

All of these elements are cross-referenced to a list of several hundred topics. This means that a number of flexible but detailed reports can be produced to aid the use of the text in teaching.

About the book

Structure of the book

The book starts with an orienting chapter that provides an overview of the material presented in the content chapters of the work. The first three full content chapters – eBusiness organisation (Chapter 2), eBusiness systems (Chapter 3) and eBusiness value (Chapter 4) – cover essential background theory. They help the reader understand the importance of eBusiness and the way it is based upon some features found in all organisations. This leads us to consider three topics which help establish the context for eBusiness: the layers of infrastructure relevant to business systems (Chapter 5), the technical infrastructure for eBusiness (Chapter 6) and the eBusiness environment (Chapter 7). All this enables the reader to better understand the key application areas of modern eBusiness, which we discuss in two chapters (Chapters 8 and 9). Chapter 10 considers the essential activity infrastructure required to plan for, construct and maintain the eBusiness. We conclude the core content with an examination of some of the likely trends that will impact eBusiness over the coming years (Chapter 11).

Structure of the chapters

The large number of chapters in the first edition of the book have therefore been brought together in 11 major chapters. Each chapter is made up of a number of sections, and each section contains a description of a pertinent concept and an example or examples to illustrate its application in the domain. Across certain chapters we re-iterate coverage of key concepts. This has been shown to improve comprehension on the part of the reader.

In addition to the revised content, the pedagogical material in this new edition of *eBusiness* has been significantly extended. Each chapter opens with a set of features designed to orient readers and prepare them for what follows.

Learning outcomes set out what the student can expect to gain from the material that follows. Each learning outcome is linked to a core principle which can be applied to business so that students are able to see how each piece of knowledge is relevant. *Chapter outlines* give an overview of the content of the chapter. A brief *introduction* sets the scene.

At the end of each chapter, the main points are highlighted in a *chapter summary*. This is followed by an extensive section of activities consisting of a review test, a series of exercises and suggestions for student projects. The *review test* comprises a series of items designed to test understanding of the content of each chapter and ability to recall appropriate answers. Answers to questions can be obtained by re-reading the relevant chapter. *Exercises* are opportunities for the reader to take what has been learnt and extend knowledge or apply it to some other situation. They are deliberately open-ended and may be used in tutorials or other learning opportunities to structure more extensive learning about the topic under discussion. *Projects* are a larger piece of work in terms of both effort and duration than a student exercise. Typically they will involve the following: some form of independent investigation, including the activities of formulating a project proposal, producing a plan of work, conducting some form of data collection and analysis, and presenting of the results. Ideally, a student research project should display elements of independent/critical thinking. It should be noted that the suggestions are expressed merely in the form of some interesting research questions; they will demand much further work to develop into a working project proposal.

At the suggestion of previous adopters of this text we have also included a critical reflection section. This is meant to challenge the student and consists of a series of questions which should lead the reader to explore the area in greater depth and analyse it critically.

The case matrix

The first few chapters of the book contain integrated cases to help explain concepts. A range of other cases are collected together in a portfolio at the back of the book. The cases provide real-world examples of eBusiness issues relevant to the private and public sectors, as well as three cases specifically focusing on key industries impacted heavily by the continuing rise of eBusiness. The cases have been specially written by the author on the basis of published sources and are designed to integrate tightly with the concepts discussed within the chapters of the book (these relationships being specified in a detailed case matrix within the portfolio). The case studies are deliberately written as independent but rich resources of educational content and can be used both as sources of consolidation and for discussion across a range of chapters and topic areas. They are referred to throughout the book and each is supported by a list of issues for discussion and a 'key terms' section.

Glossary and bibliography

Two sources of material are provided as supplements to the main body of material. A glossary defines key terminology and enables quick access to individual topics in the main text. A complete bibliography highlights some key texts that may be used to pursue further study of key areas.

1 The eBusiness domain

Introduction

You the reader will be engaging with the topic area of this book, probably every waking hour of your life. You may be using your mobile phone to text or email friends, or to access your page on a social networking site. You might use your personal computer at home to order goods online, or pay your taxes to government as a banking transaction, or apply for a job using a company website. You might use your interactive digital television to download and watch a movie. You might use your netbook or tablet or eBook reader on the train to read the latest crime thriller or perhaps even a textbook.

It should be evident from this description that information and communication technology (ICT) is constantly present as it underpins so many aspects of our modern daily life. But you probably have not taken any serious time to

ponder on the way in which such technologies actually work or how such technologies support the activities we pursue. Why should you? The very presence and contribution of ICT frequently comes to attention only when there is a breakdown in its appropriate use or a malfunction in the technology itself.

So when you find that you cannot access the *internet* because your *broadband* connection has failed, you are likely to feel frustrated. When your personal details have been accessed on your social networking profile by a potential employer, you might feel somewhat uncomfortable. When you are sent targeted emails by companies who have analysed your web surfing activities, you might feel somewhat aggrieved. When someone steals your online identity to pilfer funds from your bank account, you might feel very angry.

So it may be that, when things are running smoothly, ICT is effectively 'invisible' to all but ICT professionals. But in order for such smooth-running to be achieved, it is crucial that businesses are able to anticipate future needs, plan and implement the relevant developments and continuously seek to protect their customers. And to do this, they need employees and managers who are able to understand and reconcile the needs of the market and the organisation with the ever-evolving capability of ICT.

Electronic business or *eBusiness* is that area which involves the interaction of ICT, information systems and information with organisational activity. Not surprisingly, in such terms, eBusiness is modern business, because ICT, information systems and information are essential to the effective working of any modern organisation.

Information is so important to activity within the modern world that some have even referred to our current age as the information age. In this book we examine the very nature of information and use this to help the reader unravel the ways in which information underpins business activity of all forms. We shall demonstrate that information underlies the work of not only the high-ranking business executive but also the shop-floor worker.

Organisations have established *information systems* as systems for communication for many hundreds if not thousands of years. Such systems are used not only to control their current activities but also as the basis for changing and improving their ways of doing things. We describe how groups of inter-related information systems within businesses drive operations. We also describe the ways in which information systems are critically important for managing activities and relationships with customers, suppliers and partners.

Information and communication technology refers to any technology that is used in support of information systems. Much of the way modern businesses work is embedded or encoded in its ICT. Without *ICT systems* many organisations would cease to function. This book is a business book, not a technology book. However, we provide essential coverage of such technology to enable business professionals to better understand the ways in which ICT is being and can be used to increase the efficiency and effectiveness of both information systems and business practice.

Over a number of decades economic markets globally have been subject to two inter-dependent trends: the increasing centrality of information to effective activity and the increasing reliance on electronic networks for effective communication. Not surprisingly many contemporary markets are electronic markets or *eMarket*s: markets in which economic exchanges are conducted in whole or part through ICT. Modern trade or commerce is heavily reliant upon electronic commerce or *eCommerce*. This book provides you with a roadmap of the major ways in which such eCommerce impacts the world economy and world trade.

Hence, an understanding of eBusiness is critical to both current and aspiring business professionals. Any successful management of modern business must be based on a good understanding of eBusiness and how eBusiness fits with wider business and economic concerns. The management of eBusiness itself and the development of *eBusiness strategy* are thus critical to organisational success.

Our aim in this opening chapter is to take you on a high-level 'flight' over the terrain of contemporary eBusiness. We want to explore the major features in this terrain that we shall cover in greater detail within each chapter in the book. We do this to provide you with adequate bearings or sign posts which should help you better navigate through the material and better assimilate its key lessons. You should therefore not expect to understand the topics discussed here in one pass. Instead, you should feel free to follow links to further chapters at any time. However, once you have read through this chapter, you will find it particularly useful at some later point as a way of reviewing the material covered on the whole area of eBusiness.

Elements of the eBusiness domain

The mosaic represented in Figure 1.1 represents a tessellated structure. A tessellated structure or tessellation is a two-dimensional plane or surface which is completely covered by repeated application of one or more shapes. A honeycomb is an example of a natural tessellated structure in which one of the two regular polygons that tessellate – the hexagon (the other being the square) – is used to cover a surface. Hexagons are used within this figure to name and position the major elements of the eBusiness domain and also to illustrate the underlying structure for this book. In other words, each of the component elements contained in this mosaic is covered in more detail as a chapter of the book:

eBusiness organisation (Chapter 2). We start by covering essential core theory which helps us better understand the nature of eBusiness. This involves considering any organisation as performing business activity, communicating the nature of such activity and representing aspects of such activity in *records*. Hence, in this chapter we explore in some detail the nature of and inter-relationship between business records, business decision-making and business activity.

eBusiness systems (Chapter 3). We recognise the existence of organisation by the patterning of activity, communication and representation. This means that

eBusiness is based on three types of systems: activity systems, information systems and data systems. In this chapter we distinguish between each type of system and demonstrate how they relate in building the eBusiness through layers of what we shall refer to as business infrastructure.

eBusiness value (Chapter 4). As a whole, organisations can be considered value-creating systems. The value created comes in three major forms: products, services and social capital. Products and services can also be tangible or intangible. The growth in intangible products and services is a major driver for eBusiness. ICT now not only supports value-creation within a wider value-network, but it also allows delivery of certain intangible products and services over this value-network.

eBusiness infrastructure (Chapters 5 and 6). So infrastructure plays an important role in both supporting eBusiness, as well as providing the platform for innovation. *Technical infrastructure* refers to the necessary arrangements of information and communication technologies that make eBusiness possible. We use a high-level model of such infrastructure to provide an overview of the key technical components necessary within any form of eBusiness.

eBusiness environment (Chapter 7). Any system operates within a wider environment. As a system the business organisation can be considered as interacting with four major facets of such environment: economic, social, political and physical. The economic environment provides the motive force for the existence of business organisations as well as constraining the ways in which such organisations act and interact. The social environment critically determines issues of access to eBusiness as well as concerns such as data protection and the management of personal identity. The political environment not only sets the legislative background for business activity but also acts as a key application area for the principles of eBusiness. Finally, the physical environment is a growing concern for business and sets the context for the movement in so-called green ICT.

Forms of eBusiness (Chapter 8). eBusiness has been undertaken for over 50 years in the sense that ICT has been applied to improving aspects of the internal operations of business organisations. Over the past couple of decades, the primary innovations in eBusiness have taken place within the area of commerce. Therefore, in Chapter 7 we examine four major forms of electronic commerce or eCommerce. Business to Business (B2B) eCommerce is one of the older and more established forms of ICT innovation in the area of trade and is distinguished from Partner to Partner or P2P eCommerce in terms of its emphasis on competition rather than collaboration. Business to Consumer (B2C) eCommerce has grown exponentially with the increasing penetration of the internet and the web into households. Consumer to Consumer (C2C) eCommerce is probably the most radical and recent form of ICT innovation in the area of commerce and is particularly related to growth in online social networking.

Further forms of eBusiness (Chapter 9). But the principles of eBusiness are not only relevant to the *internal value-chain* of businesses or to the major systems of activity that form their wider value-network. We also examine the use of eBusiness principles within the public sector in the form of eGovernment, as well as exploring the growth of commerce on the move: mobile eCommerce. This leads us to explore two significant aspects of B2C and B2B eCommerce: *eMarketing* and *eProcurement.*

Activity infrastructure for eBusiness (Chapter 10). eBusiness by its very nature is located at the interaction of technology with social systems. Hence, it is insufficient just to understand technology; you must also understand the importance of the social or activity infrastructure for eBusiness. Activity infrastructure refers to the necessary processes of strategy planning, management, implementation and evaluation that must occur within organisations if they are to be successful in eBusiness.

eBusiness futures (Chapter 11). As we have already mentioned, on one level, in terms of the use of ICT to improve internal business operation, eBusiness has a pedigree of over 50 years of experience. On another level, we have spent the past 20 years or so building infrastructure for effective eCommerce. More recently, only over the past five years or so, we have seen the explosion in the use of ICT to support online social networking. All this suggests that eBusiness is becoming embedded within the infrastructure of the world economy and is therefore here to stay. But how will this business phenomenon develop? In this final content chapter we examine some of the latest trends in the area that are likely to shape the nature of eBusiness over the coming decades.

eBusiness cases. Cases are used in two major ways in this book. First, most chapters utilise an embedded case to help illustrate the application of key concepts discussed. Second, a portfolio of specially written cases is deliberately placed at the end of the book. The case matrix provided in this section of the book provides a breakdown of the relevance of particular cases to particular topic areas discussed within content chapters.

So let us provide more detail on what we shall explore in this text…
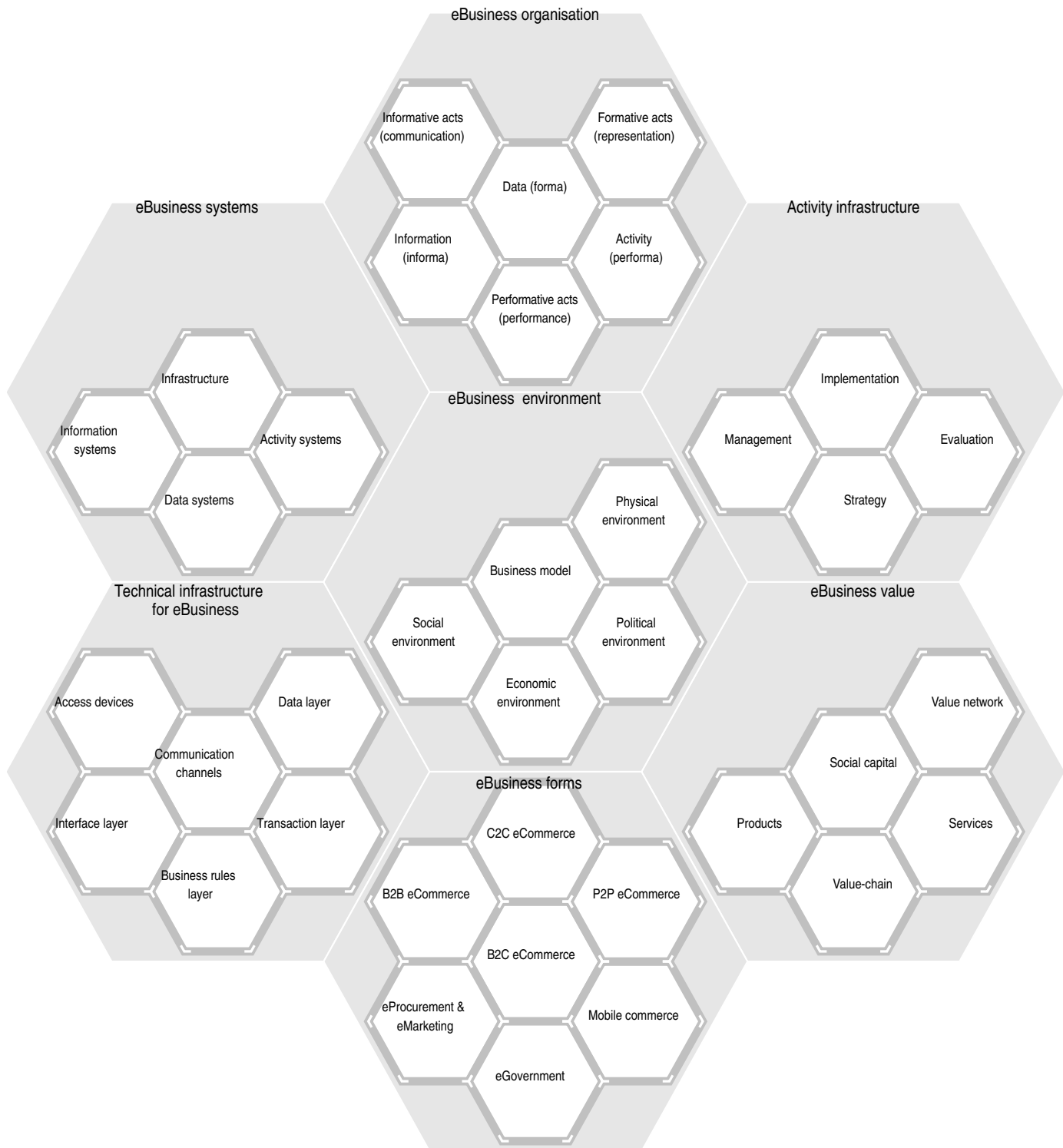
Figure 1.1 The eBusiness domain

eBusiness organisation

We use three inter-related ideas to develop a platform of theory on which eBusiness is built: signs, systems and patterns. First we explain how organisation emerges from the interaction of activity, decision-making, information and data. To help us do this we introduce a fictitious case, but which is based on real-world experience, which helps ground concepts from the eBusiness domain (Figure 1.2). We deliberately discuss this case as a history of one organisation's attempt to improve its ways of working through the application of ICT. This is the essence of eBusiness.
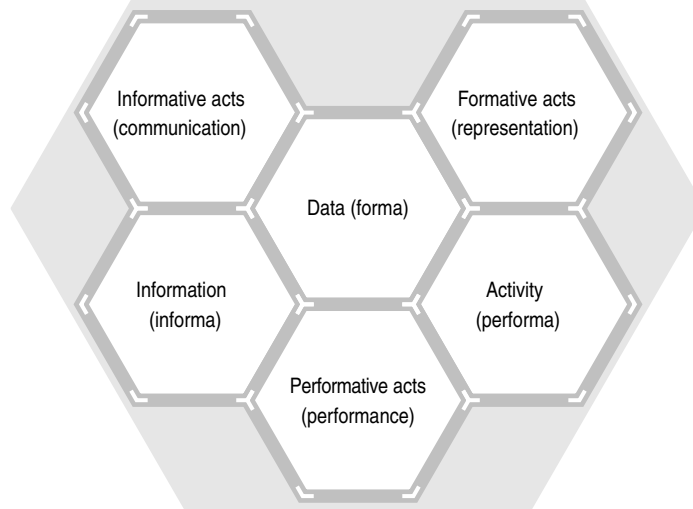
Figure 1.2 eBusiness organisation

USC case

Back in the 1980s a UK university decided to offer a series of short courses to industry. At the time it was particularly interested in offering courses in ICT of some three to four days' duration. For this purpose, it decided to set up a commercial arm – USC (University Short Courses) – to develop, market and administer such courses. Each short course offered by the company was created and maintained by one member of university staff, known as the course manager. However, depending on the popularity of the course, a course might be presented by a number of different lecturers in addition to the course manager.

USC presented such courses both at a specially prepared site on the university campus and at commercial and industrial sites throughout the UK. The former types of course were described within the company as scheduled presentations, while the latter were described as on-site presentations. Students on scheduled courses generally came from a number of different industrial organisations, while students attending on-site courses typically came from the same organisation. On-site courses gradually became a lucrative part of the business of USC as a number of companies began to use USC courses as part of their in-house training schedule for new employees.

A number of administrative activities were eventually established to manage the growing portfolio of courses and clientele. During the first couple of years of its establishment USC administrators created and maintained physical files containing paper records of courses, lecturers, presentations and attendance. The administration of financial transactions between organisations, individuals and USC was initially handled by the university's finance department, and hence no records were held by USC itself on financial matters.

During this period, bookings were taken over the telephone for courses. When a person telephoned to register for a particular presentation of a course, USC staff needed to check the number of persons already registered. Each presentation was set a course limit, meaning that staff had to ensure that the number of people registered for a presentation was not greater than the course limit. This meant that staff needed to access records about how many people had already booked for a particular presentation.

Periodically staff had to also access their files to check that particular presentations were viable to run. Eventually it was decided that four students was a break-even point for costing a presentation. On a regular basis USC staff needed to search for those presentations that had less than four students registered for them. If less than four persons were registered one month before the scheduled presentation, then the presentation was postponed and scheduled for a later date.

Two weeks before a presentation, staff telephoned each booked student to confirm attendance. One week before each presentation, staff needed to check that the presentation fee had been paid. Assuming a viable presentation, an attendance list was then produced. USC also needed to keep track of which lecturers were qualified to teach which courses. Using such records lecturers had to be assigned to scheduled courses at least six months ahead of a given course presentation.

After each course presentation, evaluation forms were handed out to attendees. On this basis data were gathered on the performance of lecturers and of courses. These data were used in decisions about revisions to the course portfolio, which took place at a special meeting held every six months.

Signs

Signs are critically important in all forms of activity, including business. Signs are important because they establish what it is to be human. Without signs we could not think, we could not communicate what we think and we could not ensure that we collaborate together successfully in our working activity.

Very broadly a sign is anything that is significant. In a sense, everything that humans have or do is significant to some degree. Sometimes not having or doing anything is regarded as significant. The world within which humans find themselves is therefore resonant with systems of signs. Signs are core elements serving to link issues of human collaborative activity, human communication and the representation of things in records.

Therefore, it is useful to view a sign as being composed of three aspects, which we call *forma*, *informa* and *performa*. Forma stands for the substance of a sign and concerns its physical representation as data. Informa relates to the meaning associated

with a sign and concerns the interpretation of data as information. Performa relates to the use of the sign to facilitate coordinated activity or performance.

Activity

Humans rarely engage in totally individual activity. Instead, our individual activity is normally part of a complex web of collective activity. Whenever a group of people get together and attempt to engage in collective activity the issue of coordination arises. In other words, some way must be found of answering the question: 'how do I coordinate my activities with others in pursuit of common goals?'

For instance, in the case of USC the activities of lecturers and students needed to be coordinated. A particular lecturer needed to appear at a particular site at a particular time to deliver a particular course. Likewise, the employees of particular companies needed to know where to go and at what time and date to receive instruction in a particular course.

Information

To enable coordination of activities performed by particular business actors such as lecturers and students in pursuit of a collective goal, then communication is needed. In the case of USC, administrators needed to be able to communicate to lecturers when and what they were teaching and to students when and what instruction would be received. This could of course have been done through verbal communication: we could telephone lecturers to tell them what they are teaching and we could telephone students to tell them when to come on a particular course.

Data

However, as the number of students and lecturers increases as part of the business of USC, relying upon verbal communication and the individual memory of particular USC staff, lecturers and students is likely to prove difficult. Hence, most organisations keep records of the things of interest or significance to them. For this purpose USC started to construct and maintain structured records of data on things of interest to them: their lecturers, courses, students and presentations.

Hence, data are *symbols*. For example, if we were to inspect one of the attendance records used by USC at this time we would see the string of digits – 023563 – was used. As a collection this forms a symbol. However, the symbol by itself is meaningless beyond being a set of digits. Symbols are given meaning through the assignment of convention or context. Hence, this symbol amongst others of the same type was conventionally treated as a code by USC administrators to stand for given students: it was a student identifier. Information is thus data given meaning and used for communication in support of activity.

Decisions

Data and information are clearly critical to decision-making. A decision involves selecting an appropriate course of action in particular circumstances. Records are not only useful for making everyday operational decisions about actions such as whether to run a course presentation or not. The making of records also allows

business actors to 'model' their understanding of business activities and on this basis to make strategic or longer-term decisions about future business activity. Hence, representing information about past attendance on particular courses as well as the evaluations obtained back from course presentations helped USC managers make decisions about which courses to perhaps drop from their portfolio and which courses to promote to potential clients in the future.

eBusiness systems

Along with signs, the other idea which we use to help build our explanation of eBusiness is that of a system. A systemic analysis of eBusiness corresponds to a holistic account of this phenomenon. We take eBusiness to be fundamentally concerned with the way in which various social and technical systems interact and form business organisation (Figure 1.3).
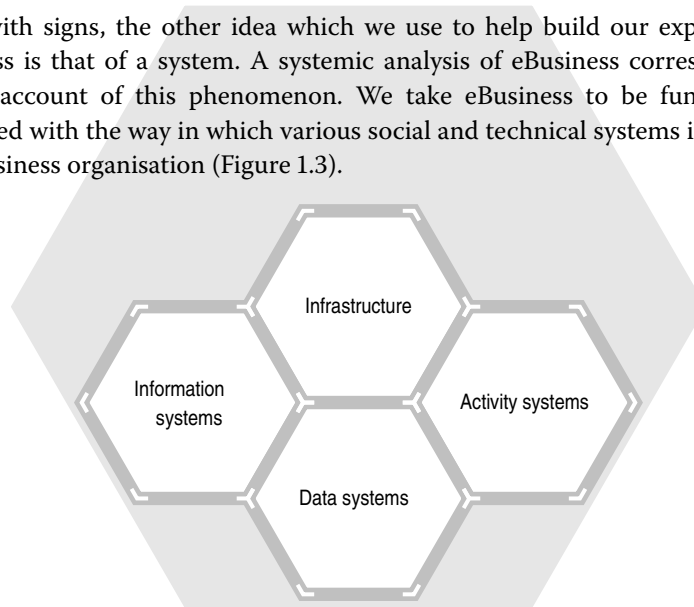
Figure 1.3 eBusiness systems

When somebody calls something a system they are normally referring to the patterning of something. In other words, they are identifying the interaction of a number of regular and recurring things. The systems concept, as we shall see, is particularly valuable because of the way in which it can be applied to patterns that exist in three inter-related areas: technology (data system), information (information system) and human activity (*activity system*).

Therefore, eBusiness is founded in the interaction of these three types of system: systems of activity, systems of information and systems of information and communication technology. Such systems amount to the patterning of performance, communication and representation respectively. Every activity system will rely on information for effective collaboration and coordination of activity. Information will be communicated by associated information systems which in turn will rely upon systems of representation. Data or ICT systems are an inherent part of most contemporary information systems because they manage the data resource on which much communication is based in the modern business world.

Activity systems

Organisations, particularly business organisations, consist of complex chains of activity systems. An activity system is a social system, and as such is often referred to as a 'soft' system. It comprises a logical collection of activities performed by some group of people, normally in fulfilment of some goal or goals. Another term now much used as a synonym for an activity system is organisational or business process.

We can understand an activity system as consisting of a recurring pattern of *performative acts*. For instance, one crucial activity system for USC is that series of activities required to run a particular course. The pattern of performative acts evident in this activity system looks something like this: create course, assign lecturers, schedule presentations, take bookings, deliver presentations, evaluate presentations. This pattern of activities is repeated continuously within the operation of USC as an organisation by different persons or business actors.

Information systems

An information system is a system of communication between people. As we have seen, information systems support activity systems in the sense that information is important for the coordination of human activity to meet established goals. We can understand an information system as consisting of a recurring pattern of communicative acts. Hence, to schedule a given presentation of a course USC administrators have to communicate with potential lecturers as to their availability. They then have to gain commitment from a chosen lecturer to present a given course on a nominated date in the future. This leads to communication with potential customers who may have declared their interest in taking a particular course of instruction.

Data systems

Because a number of USC staff need to coordinate their performative and communicative activity, records have to be created, updated and retrieved. Hence, one member of USC staff may take a telephone call from a potential customer asking to know when the next available presentation of a particular course will take place and who will present this course. They also wish to know whether any space is left on this course. To ease the burden on human memory the USC member of staff consults a record previously made for this purpose by some other administrator and communicates the result of this to the enquirer.

Data systems are therefore 'hard' systems because they are physical or technical systems. At a high-level a data system can be seen to consist of recurring patterns of formative acts operating upon data structures. In this sense, we use the term data system to stand for not only modern ICT systems but also traditional, so-called manual record-keeping systems. This allows us to correctly position the role of much modern ICT within the business. It also however allows us to demonstrate the value of modern ICT over older forms of information and communication technology such as filing cabinets, file folders and paper forms.

Control and management

The recurrent patterning of activity, communication and representation characteristic of organisations is evidence of control in organisations. Control is the process that implements regulation and adaptation in systems. Systems generally exhibit some form of control to maintain systems in some form of equilibrium but also to enable systems to adapt to changes in their environment. Control can be viewed in terms of a monitoring *subsystem* or process that regulates the behaviour of other sub-systems. This monitoring or *control subsystem* ensures defined levels of *performance* for an operational system by imposing a number of *control inputs* upon the system.

In such terms, management is clearly a control process within organisations. Management is an activity system that controls other activity systems. The primary activity of management is making decisions concerning organisational action. Effective management decision-making is reliant on good information. Effective management decision-making is reliant on the effective definition of performance and the construction of effective performance management systems for managerial activity. The recording of data about performance is thus critical to performance management.

Consider the case of USC in this light. USC needs to sell course attendance to customers to generate income. As part of their on-going activity USC needs to collect data on sales of courses to particular customer groups. Such sales can then be compared against targets (control inputs) set by the company for such sales activity. If current sales are below target then actions need to be taken to increase sales. This is the essence of organisational control as regulation. But evaluation data gathered from customers can also help USC adapt its educational services. For instance, it might find continuous requests in its evaluation data for particular topic areas of interest. It can use this data to change its course portfolio in response to changing customer demand.

Infrastructure

Organisation requires infrastructure. By infrastructure we mean the entire collection of systems necessary for an organisation to achieve its goals. From our discussion above it should be clear that there are at least three vertical layers of infrastructure crucial to eBusiness. Activity systems infrastructure constitutes the entire collection of activity taking place within activity systems necessary for supporting the creation and distribution of value. *Information systems infrastructure* consists of the entire set of inter-related information systems needed to support communication activity within the organisation. Data systems infrastructure fundamentally consists of the necessary systems of record-keeping necessary to supply information for decision-making. As we shall see, within the modern organisation this consists of the hardware, software and communication technologies available to the organisation necessary to maintain effective data systems.

Such layers are clearly organised in a *hierarchy*. The information systems infrastructure supports the activity infrastructure. In turn, the information systems infrastructure of some organisation will be supported by an *ICT infrastructure*. It

is also possible to think of infrastructure in terms of a horizontal division between those systems concerned with external activities and those systems associated with internal activities. The former is frequently referred to as the front-end or front-office of the organisation. The latter is often called the back-end or back-office of the organisation.

eBusiness value

The primary goal of most organisations is to produce some form of value. Therefore, organisations are value-creating or value-producing systems. Organisations can be thought of as chains of inter-related activity systems associated with the production and dissemination of value. For commercial organisations such value will typically constitute goods. For public sector organisations value will typically consist of the services such organisations provide. Within the community, value will consist of social capital – networks of information, trust and reciprocity.

A good is some form of product produced by an organisation and distributed to the customer. A service is some form of activity performed by an organisation for a customer. Goods and services are the end-points of activity systems performed in business organisations. They are thus typically outputs delivered to the customer of the organisation.

It is possible to distinguish between two types of good: physical or tangible goods and non-physical or intangible goods. This distinction has a bearing, as we shall see, on the degree to which such forms of value can be delivered through aspects of electronic commerce. Tangible goods have a physical form and hence cannot be delivered to the customer electronically. Intangible goods may fundamentally be represented as data. They are hence sometimes called digital goods because they are amenable to digitisation and consequently may be delivered to the customer over data communication networks.

Similarly, services can be classified as either tangible or intangible. Certain services are tangible in nature and hence not amenable to electronic service delivery. Other services are intangible by nature and thus primarily constitute communication services. They are hence open to delivery through electronic channels.

The value produced by USC is primarily one of services. A course is an educational or training service delivered to particular customers. The value USC produces is therefore bound up with the perceived quality of the courses it delivers. A course traditionally is a tangible service in the sense that it demands actual persons to deliver material in a physical setting to a group of other persons that are co-present. The so-called correspondence course started to break down this form of instructional delivery and in its original form involved packaging all course material as an instructional paper package posted to the student and undertaken by the student at her own pace. Such forms of instruction or 'content' are clearly amenable to digitisation. Hence, with the rise of the internet and web (see Figure 1.4), USC started to produce a limited range of its courses for electronic delivery. As such, a proportion of their tangible services started to become intangible in nature.

Associated with the flow of any goods and services is a corresponding flow of transactions. A *transaction* is a data structure that records some coherent unit of activity, typically an event within some activity system or between activity systems. As we have seen, data and information are needed to support not only the internal activity of organisations but also exchanges between organisations and individuals. Transactions are hence critical to the recording of organisational activity – past, current and future. Transactions typically write data to the *data stores* of some data system. Such data, interpreted as information, are important to the measurement of organisational performance and critical to effective decision-making by business actors.
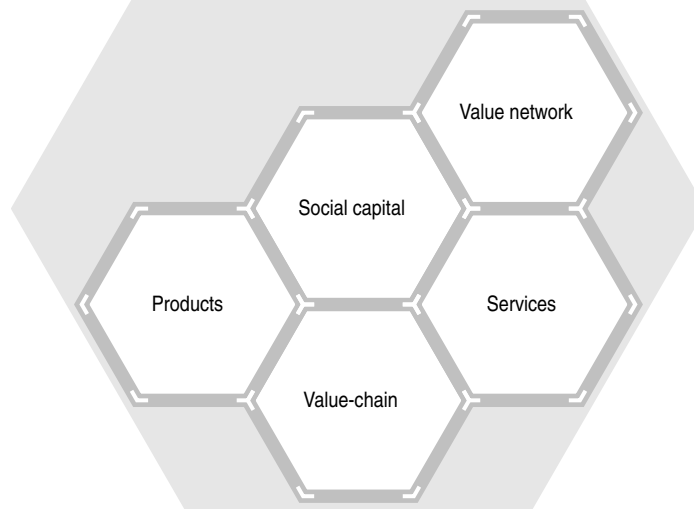
Figure 1.4 eBusiness value

Hence, organisations can be seen as consisting of a series of interdependent chains made up of related activity systems that deliver value. Organisations, as systems, also exist within a wider value-network consisting of chains of value between the organisation and external actors. Types of such external business actor include customers, suppliers and partners. This means that five value-chains are significant for most businesses:

1. the internal value chain consisting of a series of activity systems by which the organisation produces value;
2. the supply chain consisting of those activity systems by which an organisation obtains goods and services from other organisations;
3. the customer chain consisting of those activity systems by which an organisation delivers value to its customers;
4. the community chain consisting of those social networks surrounding the business that support value generation between individuals and groups;
5. the partner chain consisting of those activity systems that support coordinated or collaborative value creation by two or more organisations to the same set of customers.

Fundamentally, as we shall see, eBusiness and eCommerce focus around innovation within such organisational value-chains. The trend to use ICT to re-structure aspects of the internal value-chain of organisations has been on-going for a number of decades. In more recent years, ICT has been used to re-engineer aspects of the customer and supply chains important to a particular organisation. ICT is also being used to build bridges between an organisation and the larger community, as well as between the organisation and its partners in value creation.

Therefore, each organisation such as USC has a distinctive internal value-chain and external value-network. The internal value-chain of this company consists of activity systems such as course production, course delivery, marketing, course sales, on-site negotiation and course administration. The external value-network of this company involves its relationships and activities with its suppliers such as printers of publicity material and venue providers like hotels. It also includes its relationships and activities with its customers – students – and its partners – academic and administrative staff within the university.

Commerce

Commerce consists of the exchange of products and services between businesses, groups and individuals. Commerce or trade can hence be seen as one of the essential activities of any business. Commerce of whatever nature can be considered as an activity system of exchange between economic or business actors with the following generic phases or sub-systems: pre-sale activities occurring before a sale occurs; sale execution comprising activities involved with the actual sale of a product or service between *economic actors*; sale settlement involving those activities which complete the sale of product or service; and, after sale, consisting of those activities which take place after the buyer has received the product or service from the seller.

It is also possible to distinguish between three major patterns of commerce in terms of their frequency of occurrence. *Repeat commerce* is the pattern in which regular, repeat transactions occur between trading partners. Credit commerce is where irregular transactions occur between trading partners and the processes of settlement and execution are separated. Cash commerce occurs when irregular transactions of a one-off nature are conducted between economic actors. In cash commerce the processes of execution and settlement are typically combined.

USC clearly engages in commerce with a range of organisations. The pre-sale phase of its commerce activity primarily involves the enquiries it takes from potential clients and the bookings it makes with such clients for particular course presentations. Sale execution corresponds to the actual delivery of a course presentation to a particular client. Most customers of USC traditionally have their organisations pay USC some short period of time after taking a particular course – this form of sale settlement is characteristic of credit commerce. After delivery of material to customers, USC normally follows up with the particular organisations, checking quality issues and attempting to gain repeat business. This is a major part of USC's after-sales phase.

Technical infrastructure for eBusiness

The key message of eBusiness in recent years is that ICT is an enabler for organisational change focused around the re-design of the delivery of services and products to key *stakeholders* – customers, suppliers, partners and employees. Hence ICT is seen to offer the potential for more efficacious, efficient and effective delivery of value along supply, customer, partner, internal and community value-chains (Figure 1.5).
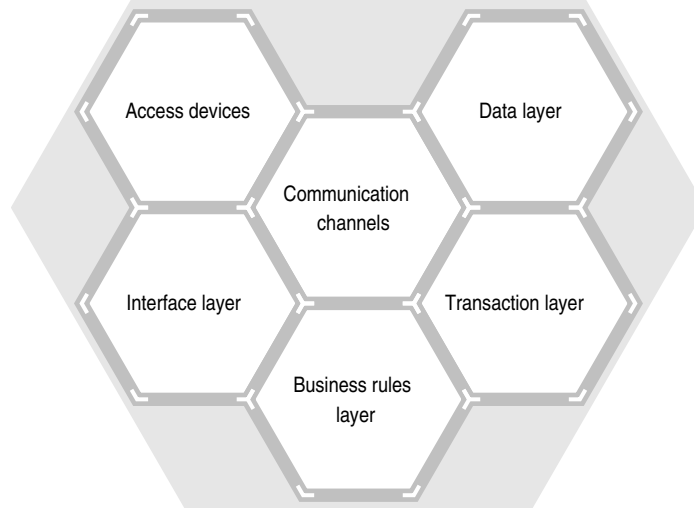
Figure 1.5 Technical infrastructure

As we argued above any organisation needs to represent in its records data about things or objects, as well as data about events or activities it regards as significant. The latter form of record, as we have seen, is frequently referred to as a transaction. Hence, in the case of USC, records were maintained about persons such as customers as well as events such as a booking by a particular customer for a particular course presentation. Transactions typically involve ways of recording the delivery of products and services and hence are the essential raw data for modelling and evaluating organisational performance. Reducing the costs associated with the administration of transactions is also a typical way of introducing cost savings with ICT.

ICT

Information and communication technology is any technology used to support data gathering, processing, distribution and use. ICT provides means of constructing aspects of information systems, but is distinct from information systems. Core elements of modern ICT include hardware, software, data management and communications technology, which are used to construct the ICT infrastructure of organisations.

It is important to recognise that information systems have existed in organisations prior to the invention of digital computing and communications technology, and hence ICT such as that described above is not a necessary condition for an

information system. However, in the modern, complex organisational world most information systems rely on hardware, software, data and communication technology to a greater or lesser degree because of the gains possible with the use of such technology.

It is possible to describe the technical infrastructure required for eBusiness as consisting of three major and inter-connected aspects of ICT infrastructure: access devices, communication channels and ICT systems.

Access devices

Internal and external actors need to access organisational systems through access channels. Internal actors include managers and other employees, while external actors include customers, partners and suppliers. In terms of interaction with the customer, face-to-face contact and telephone conversation have traditionally been two of the most commonly used channels for accessing an organisation's value: its services or products. However, over the past decade, organisations both in the public and private sectors have implemented access channels that allow customers to interact with the organisation remotely using ICT.

A remote access channel typically is composed of some access device and associated communication channel. Typical remote access devices supported within the current environment for eBusiness are the internet-enabled personal computer (PC), interactive digital television (iDTV) and smart phones. There are a number of advantages to both the organisation and its external stakeholders in the provision and use of such access channels. For instance, an organisation may be able to reduce its costs of operation while providing for its customers access to its services and products 24 hours a day, 365 days a year.

Communication channels

Access devices are used to connect to organisational ICT systems through communication channels. Communication channels within the technological infrastructure for eBusiness rely on two critical technologies: the internet and the web.

The internet is a set of inter-connected computer networks distributed around the globe and can be considered on a number of levels. The base infrastructure of the internet is composed of *packet-switched networks* and a series of communication protocols. On this layer run a series of applications such as electronic mail (e-mail) and the World Wide Web – the web for short. The web is effectively a set of standards for the representation and distribution of *hypermedia* documents over the internet. A hypermedia document consists of a number of chunks of content such as text, graphics and images connected together with associative links called hyperlinks.

The web has become a key technology for constructing interfaces to the ICT systems of organisations. Hence, the company website has become a significant way of providing electronic delivery to business actors such as customers. The term website is generally used to refer to a logical collection of web documents or pages normally stored on a web server. Because of the increasing use of such technologies by customers, major investment has been undertaken by companies in increasing levels of interactivity on their websites. Most websites provided by medium-to-

large companies are now fully transactional websites in which customers undertake a substantial proportion of their interaction with an organisation online.

ICT systems

An ICT system is a technical system. Such systems are frequently referred to as examples of 'hard' systems in the sense that they consist of physical components. An ICT system is an organised collection of hardware, software, data and communication technology designed to support aspects of some information system. An ICT system takes data as input, manipulates such data as a process and outputs manipulated data for interpretation within some information system. Hence, most ICT systems are effectively data manipulation or data processing systems.

It is useful to consider a modern ICT system as being made up of a number of subsystems or layers:

- *Interface layer*. This subsystem is responsible for managing interaction with the user. This subsystem is generally referred to as the user interface, sometimes the human–computer interface, and as we have mentioned, is now typically created using web technology.
- *Rules layer*. This subsystem manages the logic of the ICT system in terms of a defined set of business rules. These rules are typically handled by business rules engines.
- *Transaction layer*. This subsystem acts as the link between the data subsystem and the rules and interface subsystems. Querying, insertion and update activity is triggered at the interface, validated by the rules subsystem and packaged as units (transactions) that will initiate formative actions in the data subsystem.
- *Data layer*. This subsystem is responsible for managing the underlying data needed by the ICT system and stored within a set of inter-related data structures.

In the contemporary ICT infrastructure each of these parts of an ICT system may be distributed on different machines, perhaps at different sites. This means that each part or layer usually needs to be connected together in terms of some communications backbone.

Data management infrastructure

Data management is normally portrayed as one critical aspect of *back-end ICT infrastructure*. The back-end ICT infrastructure of the organisation will particularly manage the operational data of the organisation through *database systems*.

A key focus of many eBusiness strategies is to re-engineer service delivery around the customer. This requires the effective integration and inter-operability of back-end ICT infrastructure. Hence, for example, when a customer enters personal details such as their name and address into one ICT system this information should ideally be available to all other ICT systems that need such data within the organisation.

To enable fully transactional websites, the information presented to the user needs to be updated dynamically from back-end databases. Also, the information entered by customers needs to update company information systems effectively.

This demands integration and inter-operability of front-end and back-end systems within the ICT infrastructure.

USC case

As we have seen, in the early years of its administration USC used a paper-based records system. However, the company experienced a number of problems with this manual data system. For example, to ensure effective coordination of activity data needed to be communicated amongst a number of people such as venue operators, lecturers and a multitude of USC administrators. This meant that copies had to be made of documentation such as presentation schedules, consuming much-needed time and resource. A considerable amount of time was also spent in transferring data from manual records on to other documents such as course schedules. Administrators frequently made errors in entering the wrong data onto records or other forms of documentation. Further valuable time and effort was therefore expended in resolving such errors by administrative staff. Finally, it proved difficult to use the data stored in records for strategic as well as operational purposes. For example, it was difficult for managers to collate and analyse data to determine trends such as the popularity or otherwise of particular courses. To conduct such analyses meant a considerable investment of time and effort on the part of both administrative and managerial staff.

At the start of the 1990s, problems such as these persuaded USC to consider investing in the construction of an ICT system to handle basic administrative functions. Computing technology was also becoming much more affordable for the small- and medium-sized enterprise during this period.

Since ICT systems are essentially data processing systems, they rely on a core repository for the data used within the system. This repository is normally referred to as a database and is controlled by the *data management layer*. The design for the structure of the database at the heart of the ICT system is referred to as a data model. Essentially, this data model defines what data will be stored within the system and in what form. The USC data model consisted of a series of definitions for the data structures making up the database, as illustrated in Figure 1.6.

Figure 1.6 USC data model

Each data structure in this specification is made up of a number of data elements. Hence, the courses record consisted of an identifier for each course (courseNo), the name of the course appearing in the course portfolio (course-Name), the identifier of the lecturer responsible for creating and maintaining the course materials (courseManager) and the number of days specified for the training (courseDuration).

These data structures are updated by a number of update functions which trigger transactions fired at the database. Transactions change the *state* of a database from one state to another. Hence, in the USC case sample update functions might be *Create a new course record* or *Create a new booking* or *Assign a new lecturer to a course presentation.*

A considerable amount of the way in which of an ICT system works is also taken up with so-called business rules. Such rules ensure that the data held in the data management layer of the ICT system remains an accurate reflection of the activity system it represents. Hence, in the case of USC, the data stored in the data structure *Attendance* should accurately represent the students that have either participated in a past presentation, are undergoing a current presentation or have booked for a future course presentation.

The interface layer is responsible for managing interaction with the user and traditionally has been generally made up of menus, data entry screens and data retrieval screens. Hence, in the case of the USC system a bookings screen allowed administrators to enter details of a new booking and a presentations screen allowed administrators to see instantly current numbers of bookings against the presentation schedule for a particular course.

eBusiness environment

We have argued above that an organisation can be considered as an activity system or more accurately as a series of interdependent activity systems. However, an organisation is not an isolated entity; it is what we shall refer to as an open system. By this we mean that it receives inputs from its environment and feeds outputs into its environment. The environment is hence a critical enabler of organisational activity; it also constrains what an organisation is able to do in terms of its activity.

Therefore, by environment we mean anything outside of the organisation. The environment of most organisations can be considered in terms of the interaction between four major environmental systems: an economic system, a political system, a social system and a physical system. The environment of some organisation constitutes a complex network of relationships and activities between the organisation and other actors in the social, political, economic and physical spheres (Figure 1.7).

An open systems model of the organisation emphasises that the relationship between environments and organisations is reciprocal. In other words, organisations are both affected by and affect their environments. The shape of and trends within each area of the environment will exert an impact on the eBusiness activities

of some organisation. Likewise, the eBusiness activities of organisations are likely to impact the social, economic, political and physical environment.
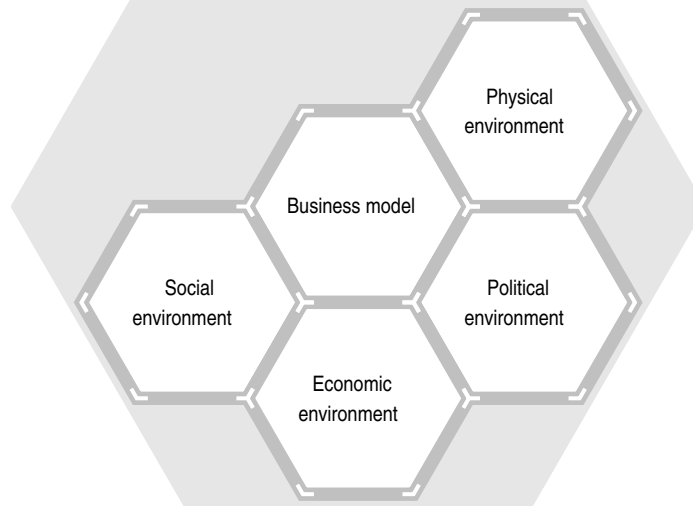

Figure 1.7 eBusiness environment

Economic environment

For commercial organisations the economic environment of the organisation is probably the most important. Business organisations exist and operate within some economic system. At the level of the nation-state we speak of such an economic system as being an economy. An economic system is the way in which a group of humans arrange their material provisioning and essentially involves the coordination of activities concerned with such provisioning.

Three major activity systems at the macro-level are important to economic systems: production, distribution and consumption. Production is that set of activities concerned with the creation of value: goods and services required for human existence. Distribution is the associated activity system involved in the collection, storage and movement of goods into the hands of consumers and providing services for such consumers. Consumption is clearly the activity system through which consumers receive and use goods and services.

Therefore, production and distribution are activities that deliver value while consumption is an activity that uses value. Hence, economies can be seen as a complex of value-networks that cause value to flow both within and between economic actors. This means that economic actors, such as suppliers, customers, partners and organisations themselves, interrelate and interact in complex networks of value production, distribution and consumption. A particular economic actor will take on different roles within a number of different value networks. Hence, an organisation may be both a supplier of some other organisation as well as being a customer of another within its value-network.