Exploiting IT for Business Benefit
The British Computer Society

BCS is the leading professional body for the IT industry. With members in over 100 countries, BCS is the professional and learned Society in the field of computers and information systems. The BCS is responsible for setting standards for the IT profession. It is also leading the change in public perception and appreciation of the economic and social importance of professionally managed IT projects and programmes. In this capacity, the Society advises, informs and persuades industry and government on successful IT implementation. IT is affecting every part of our lives and that is why BCS is determined to promote IT as the profession of the 21st century.

Joining BCS

BCS qualifications, products and services are designed with your career plans in mind. We not only provide essential recognition through professional qualifications but also offer many other useful benefits to our members at every level. BCS membership demonstrates your commitment to professional development. It helps to set you apart from other IT practitioners and provides industry recognition of your skills and experience. Employers and customers increasingly require proof of professional qualifications and competence. Professional membership confirms your competence and integrity and sets an independent standard that people can trust. Professional Membership (MBCS) is the pathway to Chartered IT Professional (CITP) status.

www.bcs.org/membership

Further Information

Further information about BCS can be obtained from: The British Computer Society, First Floor, Block D, North Star House, North Star Avenue, Swindon, SN2 1FA, UK.
Telephone: 0845 300 4417 (UK only) or + 44 (0)1793 417 424 (overseas)
Contact: www.bcs.org/contact
Exploiting IT for Business Benefit

Bob Hughes
Contents

List of figures and tables ix
Author xi
Abbreviations xiii
Preface xv

1 The Internet, the Web and Business Opportunity 1
   Learning outcomes 1
   Introduction 1
   The internet and the world wide web 2
   Business and organizational use of the web 10
   Summary and some conclusions 15
   Self-test questions 16

2 Using the Internet to Generate Competitive Advantage 17
   Learning outcomes 17
   Introduction 17
   Business value 17
   Customer value 19
   Porter’s five forces model 20
   Generic strategies 27
   Industry maturity cycles 29
   The sustainability of success 30
   Complementary assets: outsourcing versus integration 32
   Resource-based viewpoints 33
   Self-test questions 35

3 The Value Chain and the Internet 36
   Learning outcomes 36
   Introduction 36
   Value chain models 37
   Disaggregation of business activities 43
   The downstream value chain 45
   The upstream supply chain 50
## Contents

- Types of supply chain relationship 52
- Technology issues 54
- Conclusion 56
- Self-test questions 57

### 4 The Business and Technological Environment 58
- Learning outcomes 58
- Introduction 58
- Swot analysis 59
- Environmental scanning 60
- Sociocultural factors 61
- Technological factors 63
- Economic factors 70
- Ethical, legal and political factors 72
- Conclusions 78
- Self-test questions 79

### 5 Customer Relationship Management 81
- Learning outcomes 81
- Introduction 81
- Customer relations and the internet 83
- The four pillars of customer relationship management 84
- Customer acquisition 84
- Customer retention 89
- Customer selection 91
- Customer extension 93
- Data mining 93
- Self-test questions 97

### 6 Enterprise Resource Planning Systems 99
- Learning outcomes 99
- Introduction 99
- The characteristics and benefits of ERP systems 105
- The motivation for ERP adoption and its challenges and risks 106
- Strategic decisions with ERP 108
- The ERP implementation process 111
- Strategic challenges with ERP Implementations 115
- Package–process misfits 117
- The issue of flexibility 118
- ERP and business process re-engineering 120
- Strategic enterprise management 121
- Self-test questions 125
## Contents

7 From Ebusiness Strategy to Implementation 127  
   Learning outcomes 127  
   Introduction 127  
   The real nature of strategy 127  
   Approaches to business analysis 130  
   A business proposal 134  
   Implementation issues 146  
   Implementation through programme management 151  
   Self-test questions 155  

   Activity pointers 156  

References 183  

Index 189
List of figures and tables

Figure 1.1  A star configuration 3
Figure 1.2  A network configuration 4
Figure 2.1  Economies of scale 19
Figure 2.2  Interaction of ease of imitation and the need for complementary assets 31
Figure 3.1  An example of a supply chain 37
Figure 3.2  Disintermediation: the customer deals directly with the insurance company via the website, rather than through the broker 46
Figure 3.3  Re-intermediation: customers are helped in their choice of supplier by an intermediary website 49
Figure 4.1  Roger’s diffusion of innovation curve (from Rogers (1983)) 64
Figure 5.1  Offline versus online promotion and purchasing 85
Figure 5.2  Website linkages 98
Figure 6.1  Functions of a simple wholesale business model 101
Figure 6.2  Causal mapping of ERP implementation success 116
Figure 6.3  A fragment of a simplistic credit card operation 122
Figure 7.1  A conceptual model 132
Figure 7.2  A probability–impact matrix 145
Figure 7.3  Programme management organization 153

Table 1.1  A fragment of XML 9
Table 5.1  The relationship ladder (based on Payne 1995) 82
Table 5.2  A month’s sales figures by customer 92
Table 6.1  Examples of common business-wide systems 100
Table 6.2  Examples of SAP application modules 104
Table 6.3  Package–process misfits 117
Table 6.4  Misfit resolution strategies 118
Table 7.1  Cash flows for proposal A 138
Table 7.2  Cash flows for proposal B 138
Table 7.3  DCFs for proposal A (in £s) 141
Table 7.4  DCFs for proposal B (in £s) 141
Table 7.5  Barry Boehm’s ‘Top 10’ software development risks (Boehm 1991) 143
Table 7.6  Mapping risk descriptors to ranges 144
Author

Bob Hughes was born on the Isle of Sheppey in Kent. He worked in various IT development roles – from software developer to project leader – in the telecommunications, energy and local government sectors, until moving to the University of Brighton where he is a principal lecturer. Previous books include Software Project Management, published by McGraw-Hill and currently in its fifth edition, with Indian and Chinese versions. He contributed and edited the BCS publication Project Management for IT-related Projects. He is the Systems subject moderator for the BCS professional examinations and chair of the ISEB project management examination panel. His current major interest is in interactive and collaborative elearning, particularly to support greater understanding of the practical problems of implementing IT in business environments.
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>activity-based costing</td>
</tr>
<tr>
<td>ABM</td>
<td>activity-based management</td>
</tr>
<tr>
<td>ASP</td>
<td>Active Server Pages</td>
</tr>
<tr>
<td>ASP</td>
<td>application service providers</td>
</tr>
<tr>
<td>B2B</td>
<td>business to business</td>
</tr>
<tr>
<td>B2C</td>
<td>business to consumer</td>
</tr>
<tr>
<td>BoB</td>
<td>best of breed</td>
</tr>
<tr>
<td>BPR</td>
<td>business process re-engineering</td>
</tr>
<tr>
<td>COTS</td>
<td>customized off-the-shelf</td>
</tr>
<tr>
<td>CRM</td>
<td>customer relationship management</td>
</tr>
<tr>
<td>DCF</td>
<td>discounted cash flow</td>
</tr>
<tr>
<td>DTD</td>
<td>Document Type Definition</td>
</tr>
<tr>
<td>EAI</td>
<td>enterprise application integration</td>
</tr>
<tr>
<td>EDI</td>
<td>Electronic Data Interchange</td>
</tr>
<tr>
<td>ERP</td>
<td>enterprise resource planning</td>
</tr>
<tr>
<td>e-SCM</td>
<td>web-enabled supply chain management</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GIS</td>
<td>geographical information system</td>
</tr>
<tr>
<td>GPS</td>
<td>global positioning system</td>
</tr>
<tr>
<td>GRN</td>
<td>goods received note</td>
</tr>
<tr>
<td>HTML</td>
<td>HyperText Markup Language</td>
</tr>
<tr>
<td>HTTP</td>
<td>HyperText Transfer Protocol</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>IS</td>
<td>information systems</td>
</tr>
<tr>
<td>IT</td>
<td>information technology</td>
</tr>
<tr>
<td>JSP</td>
<td>Java Server Pages</td>
</tr>
</tbody>
</table>
Abbreviations

MRP II  manufacturing resource planning
MRP    materials requirements planning
NPV    net present value
OGC    Office of Government Commerce
OTS    off-the-shelf
P2P    person to person
PEU    perceived ease of use
POS    point of sale
PU     perceived usefulness
RFC    Requests for Comments
RFID   radio frequency identification
ROI    return on investment
SEO    search engine optimization
SOAP   Simple Object Access Protocol
TCP    Transmission Control Protocol
TTF    task-technology fit
UDDI   Universal Description, Discovery and Integration
URI    Universal Resource Identifier
URL    Uniform Resource Locator
VDU    visual display unit
WSDL   Web Service Description Language
XML    eXtensible Markup Language
XSD    XML Schema Definition
Preface

The quotation above echoes many comments from the business community about the apparent lack of understanding by some IT professionals of the business context in which they work. This concern for common understanding is shared by the BCS which, for example, believes that computing students on BCS accredited courses should have a full appreciation of the economic implications of information systems. The early development of computers – particularly in the UK where the landmark LEO series of computers was developed, made and sold by Lyons, a company which originally built the machines to support its bakery and catering business – was characterized by an engagement between business and technical expertise. This introductory text aims to give computing and information systems (IS) professionals a greater insight into the business context in which IT is developed and deployed. It attempts to explore the concerns that motivate business people when they try to define what they want from information technologists.

Some blame the way universities teach computing as one of the causes of the apparent gap in the understanding between customer-facing business and IT. While I believe that such criticism is not completely fair – in my own institution the large majority of undergraduate students spend one year of their four-year course working on placement in industry – there is an element of truth in the charge. Some computer specialists, many of whom are highly regarded in their subject discipline, fail to see much of value in addressing topics beyond the production of software that meets a precise specification. One hope in producing this publication is to persuade some colleagues that the study of the interplay between computer systems and the wider world – which is hugely broader than the matter of interface design – can be intellectually stimulating, challenging and rewarding, even for those who might regard themselves as primarily computer scientists or software engineers.

Some in large business corporations have made the effort, through organizations such as eSkills UK, to identify what IT professionals should know about business, and by extension what, in their view, computing students should be taught. While this makes a valuable and challenging
contribution to syllabus development, this is not enough to build a coherent and structured body of knowledge. Many specialist disciplines in business outside IT would understand that such bodies of knowledge have to be developed carefully over time, supported by verifiable evidence and made comprehensible and consistent through the creation of models and theories. This book, for example, draws upon models such as Michael Porter’s model of competitive forces and Everett Rogers’ models of the diffusion of innovation. It is hoped that this book can make a very modest but positive contribution to the debate on the nature of the discipline of business information systems.

The idea of ‘ebusiness strategy’ needs to be explained. The term ecommerce predates ebusiness and describes the buying and selling of goods and services online, which increasingly means via the internet. Ebusiness is a broader term than ecommerce and relates to the use of electronic means to carry out business. Usually the internet is involved but, as will be seen in Chapter 6, some internal computer processes might not use the internet but are essential to enable online transactions. Hence a broad view has been taken that all IT processes are within the scope of this book.

Until quite recently, teaching or training in IT strategy concepts to any but high-level executives concerned with the long-term direction of an organization has seemed pointless. Ebusiness, particularly the use of the internet to conduct business, has, however, transformed the place of IT in organizations. From being hidden in the depths of an organization, an organization now has IT systems that are on display to the outside world. This includes customers through business to consumer (B2C) applications and suppliers and business partners through business to business (B2B) applications. Once an IT system was a hidden back office process that simply recorded the actions of customer-facing staff; now it is increasingly the medium through which customers see and talk to an organization. Strategic business concerns were once remote from IT professionals; now these staff are becoming responsible for strategic activities.

If readers expect the material in this book to be about developing some sort of master plan that specifies, step by step, the route to an organizational objective, then they will be disappointed, although we do discuss topics such as the planning and management of programmes of business change. There is a view that is increasingly accepted that while it is essential to have long-term objectives that are clearly described and widely communicated, the steps by which the objectives are to be achieved may have to be improvised to meet the constantly changing demands and opportunities of the real world. I confess that in this book there is a tendency to use the term ‘strategy’ rather broadly to refer to the business motivations behind a particular deployment of IT.
A common theme in writings on IT strategy has been the need for true business need to drive the adoption of elements of IT. It is unarguable that IT should support business needs and that adopting technology for its own sake can be counter-productive. However, it is simplistic to suggest that management should formulate their initial business strategies in an abstract world with no consideration of technologies. The development of many technologies has had huge unforeseen consequences and often seems to have transformed the world we live in with a momentum that seems independent of any one organizing and controlling entity. One element of strategic planning will need to be the scrutiny of new technologies to see what opportunities and threats they pose for the business.

In researching and preparing this book, I have become increasingly aware of the debts I owe not just to those who have contributed directly to this work, but to colleagues who over the years have contributed to my general understanding of the subject. These include, among my current and former colleagues, Mike Cotterell, Dave King, Marian Eastwood, Pavle Bataveljic, David Coutinho, Heinz Seefried and Jon Dron. Particular thanks also go to colleagues in the Brighton Business School, including Laurence Olver, Kevin Turner, Clare Millington, Cliff Conway and Asher Rospigliosi, who by collaborating in the teaching of business concepts to computing students in such an open and helpful way have also helped to educate at least some computing staff. I have also learnt much, especially some good sources of information and new ideas, from colleagues at Nottingham Trent University and the University of the West of England where I have been an external examiner – although perhaps I should not admit this. Other sources of business education have been students who have often helped by identifying useful sources and by talking about their placement experiences. Masters students, such as Andrew Crossey and Louisa Segenhout, provided useful insights from their work environments through their project reports. There are also, of course, the businesses with whom we have worked in research, training and student work placement activities. In this respect, Trevor Marshal at the Royal & Sun Alliance and Alan Cunliffe at Ericsson were particularly good enablers and facilitators.

I would like to acknowledge the forbearance of Heather, Katherine and Tom not just in relation to the writing of this book but also generally.
1 The Internet, the Web and Business Opportunity

LEARNING OUTCOMES

When you have completed this chapter you should be able to demonstrate an understanding of the following:

- why IT specialists need an understanding of business strategy;
- the impact of the internet and web on the ways in which information systems are designed and developed;
- the characteristics of the internet and the web that have made them so pervasive;
- the ways in which revenues can be generated by web applications.

INTRODUCTION

Many observers have commented on the need within the business world for IT practitioners who not only have a grasp of modern information and communication technologies but also an understanding of the way that organizations use these technologies.

The relationship between IT and business has been transformed in the last decade or so by the almost universal adoption of internet and web technologies. This has moved an organization’s IT from being a backroom operation, hidden from the outside world, to being its shop window. This makes the design and development of IT systems which fulfil business needs even more important.

The motivation of this book is to bridge the gap between IT and business understanding. Every gap has two sides. IT professionals certainly need to be aware of business needs. However, it is important that business specialists are aware of how new technologies can present often unexpected and unpredicted opportunities – as well as risks that can in

‘To survive you have to stop being seen as a technology person and start being seen as a business person.’

extreme cases be fatal to a business. Many in the business world have, with some justification, complained about IT practitioners pursuing technological 'solutions' for their own sake rather than to support the goals of the business which employs them. Some have argued that business needs must be identified first and a strategy that fulfils those needs should then be devised. Only at this point, it is argued, should the role of IT in supporting these needs be considered. We argue that this approach is almost as blinkered as that of the computer geek. The availability of new technologies has been a constant driver for economic transformation since at least the time when the development of steam engines meant that woollen mills no longer had to be sited on rivers in order to have a source of power.

During the early decades of business computer development the focus was on automating existing clerical procedures. Business analysis and system design methods were usually based on the assumption that there were staff members who were carrying out the procedures that were to be computerized and they could be interrogated about their roles. A computer system was then designed that effectively mimicked these procedures. Today, there is often no existing system to be mimicked – new IT development is simultaneously business development. It can also be difficult to interrogate potential users of a system as many of these will be members of the public who have yet to identify themselves as possible visitors to your website.

In the remainder of this chapter we are going to explore briefly some of the key technical characteristics of the internet and the web that have contributed to their power to transform our world. We will look particularly at the characteristics that have encouraged ecommerce and ebusiness, and we will finish by looking at the revenue models that describe how money can be made from the web.

THE INTERNET AND THE WORLD WIDE WEB

A brief trip down memory lane

The internet provides an easy way to transfer data between computers. Not so long ago, computer screens were only ever seen in organizational environments where visual display units (VDUs) were attached to isolated mainframe computers. (In real life things were – and are – usually more complicated than a description of the basic technologies might suggest, so you need to understand that in places we will be simplifying matters to make them more straightforward to grasp.) This configuration meant that computer communication between users was, at best, limited to workers within the same organization. The general structure of the configuration was a star-shape – see Figure 1.1.
Generally speaking the communication lines between the computer and its terminals were commissioned and owned by the organization. Sometimes a user might be geographically remote and might be allowed to access the mainframe over the public telephone system – a **dial-up connection**. This was like making a normal phone call in that you paid for all the time that you had exclusive control of the channel, even though you might not be using it. It was possible to engineer a link between two mainframes but these usually needed dedicated lines.

These arrangements had serious limitations. The first, as we saw above, was that communication was limited to people within the organization. Computer data could be transferred between organizations but this would often involve the physical delivery of magnetic tapes. Even this was not straightforward as different computer models (sometimes even those made by the same manufacturer) could have different data formats.

Another potential disadvantage was the vulnerability of the central computer at the heart of the star-node. If that went down then the network was dead. Associated with this were the restrictions the star configuration put on growth. The capacity of the central computer through which all communication travelled was a bottle-neck that constrained the number of terminals that could be added to the system.

**The emergence of the internet**

The vulnerability of the central processor was of particular concern for military planners in the United States at the time of the cold war, when the
threat of a nuclear strike seemed very real. This motivated the design of a decentralized networked system to link computers where there was no single central processor, but a number of routers at various junctions in the network of communication lines – see Figure 1.2. If one pathway between two computers failed, an alternative pathway could be found. As well as being robust, this architecture was scalable – new nodes (that is, computers), lines and routers could be added with relative ease, leading to the universal system that we have today.

The original method of communication between computers was by lines where the machines had sole use of these lines during the time when they might need to communicate. This can be a particularly wasteful use of a computer link, especially if a human user is involved who spends time fumbling over a QWERTY keyboard and not actually using the line efficiently. The solution to this was the use of data packets. Lines were not exclusively reserved for the use of two terminal nodes. Computer data was transmitted by the sending of a number of segments which were reassembled at the receiving end. Data packets belonging to different computer dialogues could be interspersed as they travelled around the network. This made the system much more efficient as a line could be simultaneously used by many different users, rather than being reserved for just one lucky pair.

We have already noted how different makes of computer could have very different architectures and operating systems and could even have different data formats. This means that the internet depends on agreement about how technologies are to interoperate. This is rather like a road transport system – such a system needs a physical structure but...
also agreement on how it is to be used, for example on which side of the road vehicles will be driven, what the procedures will be at crossroads and roundabouts and so on. In the computer world these conventions are known as protocols. A protocol is a particular form of standard, an agreed common way of doing something. Different computers could have different architectures but could communicate if both used the same protocols for this purpose, just as a Chinese airline pilot and a German air traffic controller can communicate by both speaking English when the plane is about to land.

**ACTIVITY 1.2 ESTABLISHING STANDARDS**

These days barcodes are used to identify goods in most shops that have point of sale (POS) equipment. What standards would have had to have been agreed for barcode systems to work in shops? Who would have needed to have been involved in the agreement of the standards?

Some standards have been enforced by governments and have a legal force. Governments, however, are local while commerce and communication are global. As a consequence some international bodies, such as the ISO, the International Standards Organization, have been established to obtain agreements on international standards. One problem for such organizations is that almost by definition the standards have to be based on agreement and consensus and this can be time-consuming to achieve, especially as there is national pride and competitive advantage involved with a particular national standard becoming international. Delays can also result from a natural desire that the standards should reflect best practice and the identification of this best practice can take time. While these negotiations are going on, the people on the ground have to find immediate solutions to their day-to-day problems and this is likely to lead to the emergence of imperfect, but workable, informal practices. One of the reasons for the rapid development and adoption of the internet was the relatively flexible and informal approach whereby standards were shaped through a series of Requests for Comments (RFCs) using a process with an emphasis on getting working implementations of proposals up and running quickly.

The internet is distinguished largely by two important protocols.

(i) **Transmission Control Protocol (TCP)** governs the way that computers sending and receiving data across the internet behave. It covers things like the way in which the data that is to be sent is broken down into packets and how they are then put together again at their destination.

(ii) **Internet Protocol (IP)** defines how routers pass the packets through the network.
Alternative ways of doing these things have been defined in competing protocols, some of which have come through the ISO, but in the end it has been the internet with its TCP/IP protocols that has become predominant.

The web

The web is separate from but dependent upon the internet. There are things that we can do with the internet that do not involve the web, the most obvious of which is sending email.

FTP which is used for transferring files is another example of a non-web internet application.

The internet provides a means by which electronic data can be sent from one computer to another. However, the two computers would also need to have complementary software – the sender to create the data and the recipient to interpret and process it. For example, a computer might send a data record containing the string '0304193230092003M'. This string on the face of it means little or nothing, but the recipient computer may have software that interprets the data as two dates, 3 April 1932 and 30 September 2003 (which are the dates of birth and death of a certain male – hence the 'M'). This computer might then calculate the lifespan of the male in years, perhaps as part of some research into life expectancy. The two communicating systems need to share some kind of template which describes the format of the data.

Electronic Data Interchange (EDI) is designed to facilitate B2B data transfer based on this model.

Things are in some ways a lot easier if the data is destined for a human rather than a machine: we can then use normal text – as in this book – and, hopefully, can convey meaning to the reader without the intervention of a machine.

Lots of useful information can be conveyed as text. Diagrams and pictures can be embedded in text. To reproduce a page of text, like this one, so that its overall appearance is maintained, some formatting information is required. This might include the fonts to be used, the places where the text will be indented and where new lines are to start (in the case of poetry and more prosaically lists), where there are gaps between lines and so on. Where the text is designed from the outset to be held electronically we can enhance it by adding hypertext features such as the ability to jump from one part of the document to another part or even to other documents. If there were some way by which this text could be retrieved from a distant computer along with formatting instructions that the requesting computer could use to reproduce the appearance of the original document,
then this would constitute a powerful information tool. The two computers could have radically different architectures but if there was a standard way of representing text and formatting rules, then software applications that generated and presented data in the common format could be written for each hardware/software platform. Every computer regardless of design could then pass information to every other computer.

This, crudely, is what the web does. A key figure in the development of the web has been Tim Berners-Lee who invented the fundamentals of the web when he worked for CERN, the European Particle Physics Laboratory, based near Geneva in Switzerland. This laboratory conducts experiments probing the nature of matter which can involve literally hundreds of scientists from all over the globe, so it was an appropriate place for the birth of the web. The web is based on three protocols: HyperText Transfer Protocol (HTTP), HyperText Markup Language (HTML), and Uniform Resource Locators (URLs).

(i) HTTP defines the methods by which information is requested by one computer (the ‘client’) from another (the ‘server’) and by which the information is then sent back.

(ii) HTML is used for formatting text and other objects so that they can be represented in a predictable manner by a distant computer.

(iii) URLs provide an addressing mechanism that allows you to identify a specific document belonging to a specific computer that you wish to access. URLs are hierarchical so that the first part refers to the particular website, for example www.bcs.org.uk, but additional identifiers can specify lower level components, for example www.bcs.org.uk/code_of_conduct.

Berners-Lee also created the first web-browser and the first web-server (info.cern.ch). The platform that these were created on was the NeXT machine – an interesting choice, but not exactly a mainstream platform. But in one way this was itself making an important point. Berners-Lee wrote:

‘What was often difficult for people to understand about the design was that there was nothing else beyond URIs, HTTP and HTML. There was no central computer ‘controlling’ the web, no single network on which the protocols worked, not even an organization anywhere that “ran” the web. The web was not a physical ‘thing’ that existed in a certain ‘place’. It was a ‘space’ in which information could exist.’

Berners-Lee and Fischetti (1999, p. 39)
Technological systems based on networks, which include railways and telephones, increase their value as more people adopt and extend the number of nodes on the system and the terminal points on the network. It is rather like that joke about Bell inventing the first telephone in 1876 but it not really taking off until someone had invented the second one. Thus a major part of the story of the internet is the at first slow but then constantly accelerating adoption of the web, enabled by enthusiasts who implemented the protocols for different types of computers and computer environments.

Dynamic pages

A web with the characteristics outlined in the previous subsection might be excellent as a way of storing and distributing information, but the static nature of the content that is implied does not support the needs of business applications. Anyone who uses the web now will know that web pages can be dynamic, for example there can be moving images.

If a server machine can retrieve an existing HTML document with static content and send it back to the client that has requested it, then it can cheat and create the HTML ‘on the fly’ in response to the request. It might do this, for example, by taking the details requested from a conventional database and then converting them to HTML. This is known as server-side processing and examples of the software technologies that support this include Active Server Pages (ASP) from Microsoft, Java Server Pages (JSP) from Sun Microsystems and PHP: HyperText Preprocessor.

Another way of making pages active is by transferring executable code to the client which the browser can then execute. This is the principle behind Java applets and ActiveX controls that carry out client-side processing.

Machine-to-machine communication via the web

Normal communication between a client and a server using the internet is already machine-to-machine communication as the client and server are on two different machines. However, at the client end the assumption is that there is a human being accessing the system via a web-browser. This need for a human being can be restrictive. The users may want to access data from another computer using the web and then update a local
computer application with the information extracted. Simply reading the
information on one system and then typing it into another – known as
‘swivel-chair transfer’ – is both tedious and error-prone. The solution to
this has been to allow machines to communicate directly over the web via
web services.

<table>
<thead>
<tr>
<th>TABLE 1.1</th>
<th>A fragment of XML</th>
</tr>
</thead>
</table>
| <?xml version="1.0"?>
| <subjectRecord>
| <subject identifier = '0001'>
| <dateOfBirth>
| <dobdd>3</dobdd>
| <dobmm>4</dobmm>
| <dobyyyy>1932</dobyyyy>
| </dateOfBirth>
| <dateOfDeath>
| <doddd>3</doddd>
| <dodmm>4</dodmm>
| <dodyyy>1932</dodyyy>
| </dateOfDeath>
| <gender>M</gender>
| </subject>
| </subjectRecord>

One obstacle to be overcome that we have touched upon already is that,
where human-readable text is communicated, interpretation – if it is in
English or another familiar human language – is not a huge problem.
When a computer talks to another computer, arrangements have to be in
place to encode and interpret the data transmitted. This can be done
using XML (eXtensible Markup Language). This can be seen as an HTML
for machines. Its concern is not accurate visual presentation, but what
the data actually means. In the section on ‘The web’ above we had an
example where the string ‘0304193223092003M’ held the dates when
a person was born and died and their gender. This might be presented in
XML using statements like those in Table 1.1.

A template for this data structure could be recorded separately using
a recognized notation like a DTD (Document Type Definition) or a XSD
(XML Schema Definition).

The protocol that allows human-free machine-to-machine communica-
tion via the web and using XML is SOAP (Simple Object Access Protocol).
In order for a web service to be usable by clients, a document must exist in
the Web Service Description Language (WSDL) which describes what the
service actually does, where it exists and how it is called.

UDDI (Universal Description, Discovery and Integration) provides
a mechanism that enables directories of web services to be compiled.
These registries might be public and generally available, or private and
only identify services accessible by systems belonging to a particular
organization.
Exploiting IT for Business Benefit

An example of the use of a web service might be where a computer-based payments-received application has to deal with payments made in different currencies. For accounting purposes, foreign currency amounts have to be converted to sterling values at the current exchange rate applicable when the payment was received. The system could request via the internet a web service provided by a financial institution which could return the current exchange rate. This could automate what could clearly be time-consuming clerical work.

Introductions to the business aspects of web services can be found in Hagel and Seely Brown (2001), Lim and Wen (2003) and Ray and Ray (2006).

BUSINESS AND ORGANIZATIONAL USE OF THE WEB

Ecommerce, ebusiness and egovernment

At first the public internet and the web were the domain of academics and researchers. This was mainly because the internet had originally been financed by the US government and academic institutions. Commercial email services, such as MCI mail and CompuServe, developed in parallel. In 1989 the linking between the commercial services and the not-for-profit internet was permitted. The internet was privatized in the mid-1990s and commercial use since then has flourished.

Many distinguish between ecommerce and ebusiness. Ecommerce focuses on the buying and selling of goods and services over the internet. Most commonly this is associated with B2C (business to consumer) transactions where businesses, such as www.amazon.co.uk, sell goods to individual consumers. Sales transactions could, however, equally be B2B (business to business) where, for instance, one business buys components from a supplier which are then assembled. There is also the possibility of one member of the public selling an item, such as an unwanted piece of furniture, to another member of the public, using the internet – this would be C2C (consumer to consumer). This is the equivalent of the small ad in the local newspaper and like that it is usually facilitated by some third party such as eBay. For completeness one can also mention P2P (person to person) where the interaction is personal and social in nature rather than commercial – FriendsReunited might be an example of this.

In the previous main section, which talked about the bad old days, a rather primitive state of affairs was described. However, IT practitioners in the business world did not simply sit on their hands putting up with these problems and waiting for the internet and web to come along. There were many developments in EDI (Electronic Data Interchange) that allowed, for example, British Telecom to invoice electronically utility companies.
The Internet, the Web and Business Opportunity

such as Scottish Power for their telephone usage. A general problem was that each EDI link had to be developed individually. This meant that nearly all EDI links were B2B. An initial novelty of the web was therefore to enable B2C transactions. However, this particular focus on B2C was not to remain for long.

Ecommerce is just one element of ebusiness, which is the term used to describe the wider use of internet and web technologies in a business environment. For example, many large corporations now require job applications to be submitted electronically. It will be recalled from the section on ‘The web’ that the origins of the web lie in a desire to share technical information. This need still exists. However, an organization might not want to share its information with the whole world. It might, therefore, use web technologies, such as browsers, to create an intranet where access is restricted to a chosen few. These could be all or a subset of their staff, or could include some external users such as their distributors. It has been reported, for example, that at Norwich Union key marketing staff have access via an intranet to thousands of pertinent research documents, presentations and reports (Everett 2005). In this example the information is maintained in a content management system which is accessed via an intranet.

As well as businesses, government organizations at both national and local levels are using web technologies to inform and to communicate with the citizens of their country, towns or neighbourhoods – hence egovernment.

Business characteristics of the web

The web (or indeed IT in general) is not the solution to every business problem. However, some particular characteristics of the web can be exploited by business applications and these are listed below.

Global reach

The web can be accessed by millions of people worldwide. This means that local businesses can become global ones (Hilpern 2005). The Shropshire Spice Company, for example, based in the heart of rural England has a website that potentially gives it a global presence (www.shropshire-spice.co.uk). However, even where there is access to the web, there are still many communication barriers, the most obvious of which is language. And overcoming communication barriers does not automatically overcome trade barriers, many of which are initially not visible – such as the different formats for European and American DVDs.

A constraint that is perhaps more important for egovernment than for ebusiness is that the reach of the web is not universal in social terms – those who do not have access to the web are often those who are the poorest. One response to this has been to seek alternative ways of accessing the web, by interactive TV or mobile phone for example.
Time independence

A website can operate all day and all night and every day of the year. Apart from allowing domestic consumers to carry out transactions at their own convenience, this contributes to the global reach of the web applications as differences in time between various parts of the globe and national variations in public holidays should no longer cause major problems.

The network effect

We have already noted that network-based systems such as telephones and the railway become exponentially more valuable as more lines, junctions and end-points are added. When email was first introduced the restricted number of users meant that it could only occasionally be useful, but as the numbers of people with whom you could communicate grew, daily use has become essential if you are to keep in touch with colleagues and friends. This network effect is an important one as it applies to many new IT-based products. For example, the ability to send images by mobile phones needs a similar technology at both ends of the communication. This might have discouraged some early potential adopters of the technology.

Information asymmetry

Say a member of the public wants to trade their current car for a better one and for financial reasons they are limited to second-hand vehicles. Unless they have done some research before they go to a second-hand car dealer, the dealers may be at an advantage as they are likely to have a better knowledge of the going market rates for both the car being sold and the one being sought. This disparity in knowledge is known as information asymmetry and it is argued that the web has moved the balance of knowledge in favour of the public as they can now more easily compare prices. There are indeed websites that will carry out the comparison for you, for example www.kelkoo.co.uk. Such a comparison process is particularly effective where the product is standard and the quality well-defined, as when different suppliers are selling a product originally manufactured by a single company. There is another argument that this characteristic of the web makes it difficult to sell higher quality, but higher priced, products.

Measures can be taken to convey a sense of a product's quality – these will be discussed later under the topic of 'Trust'.

As we will see with the next characteristic, the balance of knowledge has not been tilted irrevocably to the side of the customer.

Automatic data capture

Ecommerce involves a mutual exchange of information between buyer and seller using electronic communication. Thus from the outset information is
The Internet, the Web and Business Opportunity

recorded in the language of computers. This eases subsequent processing by IT systems. To make a payment or to specify a place for delivery a customer will have to identify themselves and this information can then be used for marketing analyses (for example, via data mining).

Data mining is explored further in Chapter 5.

Low cost of access
The cost of using web technologies is relatively low. There are several reasons for this. The original development of the internet was heavily financed by the US government. Many of the early enthusiasts for the web were academics who worked in an environment where the free exchange of knowledge and, by extension, software was seen as a great virtue. The network characteristics we have noted earlier mean that there is always an initial concern to promote a network’s use as it is the number of users and nodes that make it valuable. One way of promoting a network is to make sure that it is easy and inexpensive to join. With the odd wobble (when Netscape, for example, threatened to charge) browsers have tended to be made freely available. The large numbers of users also mean the hardware needed is likely to be low in price as mass production techniques can be employed in their manufacture.

Scalability and robustness
We can see from the discussion of the origins of the internet that its distributed architecture makes it possible to deal with growth and also resilient in the case of failure in one part of the system.

ACTIVITY 1.3 LIMITATIONS, CONSTRAINTS AND DISADVANTAGES OF THE WEB

List what you think might be the limitations, constraints and disadvantages of the web (rather than just the internet).

Revenue models
Of the many frameworks for categorizing ways of making money from the web, the one described below is based loosely on that of Afuah and Tucci (2003). This focuses on ways of generating income. As will be seen later, there could be other motivations for ebusiness development, such as in particular reducing costs. Our categorization is as follows:

- sales;
- commission or referral;
- subscriptions;
- advertising.
Sales

A website can be used to sell goods and services and the revenue comes from sales. In the case of products that can take an electronic format, such as music, e-books and computer games, the web can also act as a delivery channel – an example of the web enabling cost reduction. Electronic delivery may also be of value to the customer – this would be an example of the web generating additional customer value which might attract the customer to a particular supplier. Customers might even be willing in some circumstances to pay for this additional value.

The sales category is sometimes sub-divided into mark-up and production. Mark-up refers to the difference in price between buying and selling products and is the way in which retailers, for example, make money. The products here are made by other people. Amazon is one of the most famous of these websites. With the production or manufacturing model, the originator of the goods uses the website to communicate directly with the final customer. With this model, the company might generate larger revenues, not by increased sales, but by taking profits that would normally go to intermediaries.

Commission and referral

In this case there is a sales transaction as described above. This transaction, however, is enabled by a third party who takes a proportion of the payment as commission. An obvious example of this is eBay.

Referral is a variant of the commission model where income is generated by referring visitors to one website to another. Authors of books who have their own website can encourage visitors who wish to buy their book to ‘click through’ to a book-selling website such as Amazon. A small payment (a micro-payment) may be made to the referring site.

Subscription-based

The customer pays a fixed price on, say, a monthly basis in return for the use of a service. This is typically the case with internet service providers. The charge is often, but not always, independent of usage. The utility model on the other hand works on the same principle as most utility services such as gas and electricity: you pay for actual usage.
Advertising

Where a website is frequently used, the website can charge businesses for their advertisements. One of the key factors in successful advertising is to find ways of ensuring that the advertisement is seen by people who are most likely to be potential customers, while not wasting resources on those who clearly are not. Linking advertisements to search engines where the choice of key words for searching could indicate an interest in a particular topic is one way of targeting advertising.

ACTIVITY 1.5 IDENTIFYING REVENUE STREAMS

In what ways do you think the following websites hope to generate income?

- www.tesco.com
- www.ikea.co.uk
- www.guardian.co.uk

The focus above has been on the primary revenue generators where money generally flows from customers outside the supply chain which provides the goods and services. Within the system there will be entrepreneurs who provide enabling services, such as secure payment services, to those enterprises that make up the supply chain.

SUMMARY AND SOME CONCLUSIONS

In this chapter we have stressed the importance of the interplay between the characteristics of a technology – in this case the web – and the various applications that can exploit it. The innate characteristics of the technology will influence the nature of the exploitation; sometimes a technology will reveal a ‘need’ that no-one has previously foreseen. At the same time, the way that people choose to use a technology will drive the way that it is developed.

There is sometimes an emphasis on the marketplace as a battleground where individualistic business people fight to gain a competitive advantage over their rivals. While there is obviously some truth in this – indeed most governments have legislation to promote such competition – there is also a need for co-operation to set up the systems that allow the markets to exist in the first place. In many cities some of the most impressive buildings are those built to house the markets and exchanges where commerce takes place or has taken place in the past. Compared to these the internet and web are largely invisible to the crowds thronging the streets, but they are at least the equal of these old structures.
SELF-TEST QUESTIONS

1. Which of the following is an advantage of using data packets to transfer data across a network?
   (a) Increased security from hacking.
   (b) More efficient use of transmission channels.
   (c) A variety of types of data can be enclosed in a data packet.
   (d) The data can be read by a browser.

2. Which of the following is a protocol that governs the way computers send and receive data packets across the internet?
   (a) OSI.
   (b) TCP.
   (c) IP.
   (d) HTTP.

3. Which of the following BEST describes the term ‘information asymmetry’?
   (a) The speed of data transmission is faster in one direction than in the other.
   (b) Communication cannot take place in both directions at the same time using the particular channel.
   (c) One party to a transaction is more knowledgeable than the other.
   (d) The same information can be more valuable to some recipients than to others.

4. I buy travel insurance online while purchasing a plane ticket. Which revenue model is LEAST likely to be applicable?
   (a) The sales model.
   (b) The commission model.
   (c) The reference model.
   (d) The utility model.
Index

ABC (activity-based costing), 123
access cost, 13
accreditation, 73
actionable information, 93
Active Server Pages (ASP), 8, 181
active webpages, 8
ActiveX, 8
activity-based costing (ABC), 123
advertising
newspapers, 44
web, 15, 45, 88
application service providers (ASPs), 150
arbitration services, 73
architecture scalability, 4
as-is analysis, 113
ASP (Active Server Pages), 8, 181
asymmetrical information, 12, 26, 83
automatic data capture, 12
B2B (business to business), 10
B2C (business to consumer), 10, 99
balanced scorecards (Kaplan and Norton), 123
bargaining power, 25
barriers to adoption, 168
barriers to competition, 21
behavioural segmentation, 86
benchmarking, 133
benefit profiles, 152
benefits (business proposals), 135–136
benefits management, 154
Berry and Linoff (data mining methodologies), 95
‘best of breed’ approach, 118
big bang change-overs, 112
bill of materials, 103
black hat search engine optimization (SEO), 88
blocking strategy, 32
blueprints, 152
BoB approach, 118
Body Shop, 47
Boehm, Barry (software development risks), 143
Boeing, 106, 107
BPR (business process re-engineering), 41
branerics, 80, 173
Brin, Sergey, 88
browsers, 11
business
analysis, 130–133
compliance, 76–78
corporate databases, 101, 106
customer relationships, 81–98, 83
cycles, 70
demography, 85
disaggregation, 43–45
economics, 70–72
environment, 58–80, 164–171
environmental scanning, 60–61, 165
ethics, 60, 72–74
functions, 100, 174
government intervention, 76–78
internet opportunities, 1–16
law, 74–75
location, 85
models, 101
new technologies, 59
proposals, 134–146
application service providers, 150
benefits, 135–136
costs, 137
financial case, 137–142
implementation, 146–154
plans, 136, 146
risk assessment, 142–146
regulation, 74–75
resources, 33–34
rivalry, 22
sociocultural factors, 61–63
strategic management, 127–130
supplier relationships, 51
SWOT analysis, 59, 164
technology, 63–70
value, 17, 110
business change managers, 154
business process re-engineering (BPR), 41
business to business (B2B), 10
business to consumer (B2C), 10, 99
buyers’ bargaining power, 25
C2C (consumer to consumer), 10
cannibalization, 24, 32, 47, 158
Canon, 33
capabilities (business), 33
capacity augmentation, 23
capital requirements, 21
car dealerships, 43, 47
cash flows, 138, 141
Cendian, 44
channel conflict, 47
Ciborra, Claudio, 128
client-server technology, 104
client-side processing, 8
cmpmission model (web sales), 14
communications (online), 89
compatibility (new products/services), 65
competitive advantage, 15, 110
internet, 17–35
competitors, 21, 23, 24, 60
diversity, 24
complementary assets, 31, 32
complementary products, 25
complementary technologies, 31, 63
cost leadership, 27
costs
business proposals, 137
fixed, 18, 23
reduction, 14
storage, 23
switching, 21, 25
variable, 18
credit card operation, 122
critical mass, 42, 49
cross-selling, 93
cultural barriers, 63
customer acquisition, 84–89
customer attrition, 172
customer extension, 84, 93
customer loyalty, 28
customer relationship management (CRM), 28, 81–98, 171–174
internet, 83
customer retention, 84, 89–91
customer segmentation, 85–86
customer selection, 84, 91–93
customer value, 19, 36, 159
web, 14
customer-manufacturer contact, 26
CRM. See customer relationship management (CRM)
customers
bargaining power, 25
profitability, 92
trust, 50, 73
customization
enterprise resource planning, 109, 118
software, 148
web, 91
data access, 106
data capture, 12
data cleansing, 114
data migration, 114–115
Index
data mining, 13, 28, 90, 93–96
data warehouses, 95
methodologies, 95
data packets, 4
data warehouses, 95
Davenport, T. H., 108
decentralized networked systems, 4
delivery (software), 146
Dell, 46, 52, 54
demography, 62, 85
digital Equipment, 54
disaggregation, 162
disintermediation (value chains), 25
discounted cash flow (DCFs), 141
discount factor, 140
disaggregation, 162
disintermediation (value chains), 45–46, 47
distribution networks, 22
document, 22
document Type Definition (DTD), 9
dynamic pages (web), 8
EAI (enterprise application integration), 118
Eastman Chemical Company, 44
eBay, 73
ebusiness, 10, 17, 28, 32, 63, 67, 70–72, 73, 74–75, 83, 84, 127–153, 155, 177–182
See also business analysis, 130–133
programme management, 151–153
programme organization, 153
strategic management, 127–130
ecommerce, 10, 28, 91
economic cycles, 70
economies of scale, 19, 21, 27
EDI (Electronic Data Interchange), 10
e-government, 11
electricity consumption, 71
Electronic Data Interchange (EDI), 6, 10
e-mail, 12, 164
enterprise application integration (EAI), 118
enterprise resource planning (ERP) systems, 28, 54, 99–126, 174–177
business process re-engineering, 120–121
challenges and risks, 106–108
characteristics, 105
customization, 118
flexibility, 118–120
implementation, 111–116, 118
package–process misfits, 117–118
strategic decisions, 108–111
strategic enterprise management, 121–124
environmental scanning, 60–61, 165
eprocurement, 28, 51, 109
e-relationship, 51
Ericsson, 51
ERP. See enterprise resource planning (ERP) systems
ethical issues, 60, 72
European Union, 74
exit barriers, 24
exit strategies, 146
eXtensible Markup Language (XML), 9
feasibility studies. See business: proposals
federalism (enterprise resource planning), 109
Feeny, David, 129
finance
business proposals, 137–142
fit–gap analysis, 113
Five Forces model (Porter), 20–27, 160
fixed costs, 18, 23
Fjeldstad, Øystein, 40
FriendsReunited, 10
Gebauer, Judith, 68
Guardian newspaper website, 158
Hershey Food Corporation, 108
Honda, 33
HTML (HyperText Markup Language), 7
HTTP (HyperText Transfer Protocol), 7
hubbing, 41
human resource management, 38, 178
hypertext, 6
HyperText Markup Language (HTML), 7
HyperText Preprocessor, 8
HyperText Transfer Protocol (HTTP), 7
hypothesis testing (data mining), 94
Ikea website, 158
imitation of ideas, 31
incremental change–overs, 112
industry life cycles, 29–30
inflation, 71
information asymmetry, 12, 26, 83
infrastructure, 38
innovation, 56
disruptive, 56
network effect, 66
prior technology drag, 66
products and services, 30
sponsorship, 66
sustainable, 56
uptake cycle, 63–66
insurance companies, 42
integrated information systems, 99–126
integration, 32
intellectual property rights, 75–76
intensive technology, 40
interest rates, 70
international standards, 5
internet
business rivalry, 24
business uses, 1–16, 156–158
competitive advantage, 17–35
customer relations, 83
distribution networks, 22
navigators, 49
origins, 3
value chains, 36–57, 158–164
Internet Protocol (IP), 5
intrananet, 11, 34
inward logistics, 37
IP (Internet Protocol), 5
Java applets, 8
Java Server Pages (JSP), 8
joint development, 51
JSP (Java Server Pages), 8
knowledge management, 34
knowledge–based products, 40
legacy systems, 102, 131, 170
legislation, 74
Li & Fung, 53
lifetime customer value, 93
location (business), 85
logistics, 37
long–linked technology, 40
low–value customers, 93
loyalty cards, 90
machine–to–machine communication
web, 8
manufacturing resource planning, 103
market segmentation, 62, 85
marketing, 38, 82, 86–87
viral, 65, 89
markets
niche, 49
segmentation, 62
stagnation, 23
mark–up (sales model), 17
materials requirements planning (MRP), 103
mediating technology, 40
middleware, 118
misfit resolution strategies, 118
Mobil Oil Australia, 120, 121
mobile phones, 12, 51, 68, 71, 164, 169
monetary decile analysis, 91
MRP (materials requirements planning), 103
MRP II (manufacture resource planning), 103
mutual linking (web), 88
navigators (web), 48
net present value (NPV), 140
net profit, 18, 158
network access, 13
network effect
innovation, 66
network leadership, 53
networked systems, 4, 12
new technologies, 59
newspaper advertisements, 44
niche markets, 49
Nike, 53
off–shoring, 44
off–the–shelf (OTS) software, 147, 170, 181
Olivetti, 128
Index
Index

limitations of models, 39
long-linked technology, 40
models, 37–42
limitations, 39
value networks, 40, 42
value shop (Stabell and Fjeldstad), 40, 41
variable cost, 18
vendor selection, 112
vertical integration, 54
viral marketing, 65, 89
virtual integration, 54
virtual organizations, 32
Visicalc, 63
vision statements, 133, 152
Wal-Mart, 33
web
  access, 11, 13
  advertisements, 15, 45, 88
  automatic data capture, 12
  browsers, 11
  business uses, 1–10, 16, 156–158
  commission model, 14
  crawlers, 88
  customer value, 14
  customization, 91
dynamic pages, 8
ebusiness, 10, 17, 28, 32, 63, 67,
  70–72, 73, 74–75, 83, 84,
  127–155
ecommerce, 10, 28, 91
egovernment, 11
eprocurement, 28, 51, 109
information asymmetry, 12
machine-to-machine communication, 8
mutual linking, 88
guides, 48
networked systems, 12
organizational uses, 10
personalization, 91
referral model, 14
revenue models, 13
sales model, 14
scalability, 13
services, 119
subscription services, 14
time independence, 12
time independence, 12
utility model, 14
Web Service Description Language (WSDL), 9
white hat search engine optimization (SEO), 88
windows of opportunity, 69
word of mouth, 89
workarounds, 118
WSDL (Web Service Description Language), 9
XML (eXtensible Markup Language), 9
XSD (XML Schema Definition), 9
Y2K problem, 102
New technologies are revolutionising the way products and services are delivered and consumed, changing our expectations of IT and transforming traditional business models. As IT professionals increasingly need to be involved in these business-critical developments, it is vital they understand the implications of the systems they design, develop and deploy, to ensure that business and organisational objectives are fully realised.

Key areas covered include:

- Generating business value from IT
- The internet and business opportunity
- Transforming value chains
- Customer relations and the world of eBusiness
- ERP and business process re-engineering
- eBusiness strategy and implementation

About the author

Bob Hughes is principal lecturer at the School of Computing, Mathematical and Information Sciences at the University of Brighton specialising in internet business strategy. He is chair of the ISEB Project Management Examination Panel and has carried out research and training projects for organisations including Cable & Wireless, Ericsson, Royal & Sun Alliance and Unilever.

IT is the driving force behind business, yet often the technological agenda is set with little regard for the overriding commercial goals of the organisation. Bob Hughes provides both business and IT practitioners with the necessary insight to harness technology effectively and efficiently, helping you deliver competitive success at every level.