Chapter 3
E-business Infrastructure

Learning outcomes

• Outline the hardware and software technologies used to build an e-business infrastructure within an organisation and with its partners
• Outline the hardware and software requirements necessary to enable employee access to the Internet and hosting of e-commerce services.
Management issues

• What are the practical risks to the organization of failure to manage e-commerce infrastructure adequately?
• How should staff access to the Internet be managed?

E-business infrastructure

• E-business infrastructure is the architecture of hardware, software, content and data used to deliver e-business services to employees, customers and partners.
• Defining an adequate E-business infrastructure is vital to all companies adopting e-business as it affects directly the quality of service experienced by users of the system in terms of speed and responsiveness.
E-business infrastructure

• A key decision with managing this infrastructure is which elements are located within the company and which are managed externally as third-party managed applications, data servers, and networks.

• It is also important to be flexible enough to consider new technologies to support changes required by the business to compete effectively.

Why the jargon?

• Why do business managers need to know about the jargon and technology?

While it is important to be able to understand some of the technical jargon and concepts when talking to third-party suppliers of hardware, software and services, what is of crucial importance is to be aware of some of the limitations of the infrastructure.

Through being aware of these problems, managers can with working with there partners to ensure good level of service delivered to everyone, internal and external.
Activity 3.1 Infrastructure issues

• Make a list of the potential problems for users of e-business services developed by The B2C Company.
• You should consider problems faced by users of e-business applications who are both internal and external to the organization.
• Base your answer on problems you have experienced on a web site that can be related to network, hardware and software failures or problems with data quality.

Typical problems

• Web site communications too slow.
• Web site not available.
• Bugs on site through pages being unavailable or information typed in forms not being executed.
• Ordered products not delivered on time.
• E-mails not replied to.
• Customers’ privacy or trust is broken through security problems such as credit cards being stolen or addresses sold to other companies.
Figure 3.1  A five-layer model of e-business infrastructure

<table>
<thead>
<tr>
<th>I</th>
<th>E-business services – applications layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Systems software layer</td>
</tr>
<tr>
<td>III</td>
<td>Transport or network layer</td>
</tr>
<tr>
<td>IV</td>
<td>Storage/physical layer</td>
</tr>
<tr>
<td>V</td>
<td>Content and data layer</td>
</tr>
</tbody>
</table>

**Examples**

- CRM, supply chain management, data mining, content management systems
- Web browser and server software and standards, networking software and database management systems
- Physical network and transport standards (TCP/IP)
- Permanent magnetic storage on web servers or optical backup or temporary storage in memory (RAM)
- Web content for intranet, extranet and Internet sites, customers' data, transaction data, clickstream data

Table 3.1  Key management issues of e-business infrastructure

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Detail</th>
<th>Where covered?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which type of e-business applications do we develop?</td>
<td>For example, supply chain management, e-procurement, secure online ordering, customer relationship management</td>
<td>Chapter 5 sections on e-business services and stage models Chapters 7, 8 and 9 on specific e-business applications</td>
</tr>
<tr>
<td>Which technologies do we use?</td>
<td>For example, e-mail, web-based ordering vs EDI</td>
<td>This chapter introduces different technologies at different levels of Figure 3.1 Chapter 4 discusses adoption of new technologies</td>
</tr>
</tbody>
</table>

Table 3.1  Key management issues of e-business infrastructure
### Table 3.1 Key management issues of e-business infrastructure (Continued)

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Detail</th>
<th>Where covered?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do we achieve quality of service in applications?</td>
<td>Requirements are: business fit, security, speed, availability and errors</td>
<td>Section on ISPs in this chapter. Chapter 11 on design Chapter 12 on implementation</td>
</tr>
<tr>
<td>Where do we host applications?</td>
<td>Internal or external sourcing and hosting?</td>
<td>Focus on ASPs section in this chapter Managing partnerships section in Chapter 9 on SCM</td>
</tr>
<tr>
<td>Application Integration</td>
<td>Integration of e-business solutions with:  - legacy systems  - partner systems  - B2B exchanges and intermediaries</td>
<td>Section on integrating information systems into supply chain management in Chapter 6</td>
</tr>
<tr>
<td>Which access platforms do we support? Which development technologies and standards do we use?</td>
<td>Mobile access, interactive digital TV, e.g. CGI, Perl, Cold Fusion, ActiveX</td>
<td>Focus on access devices in this section in Chapter 12</td>
</tr>
<tr>
<td>How do we manage content and data quality?</td>
<td>How are content and data updated so that they are up-to-date, accurate, easy to find and easy to interpret?</td>
<td>Web content management is introduced in this chapter and in more detail in Chapters 11 and 12</td>
</tr>
<tr>
<td>How do we manage employee access to the Internet?</td>
<td>Staff can potentially waste time using the Internet or can act illegally</td>
<td>Covered in Chapter 11 in Focus on e-business security</td>
</tr>
<tr>
<td>How do we secure data?</td>
<td>Content and data can be deleted in error or maliciously</td>
<td>Safeguards are described in Chapter 11</td>
</tr>
</tbody>
</table>

Activity – Internet infrastructure components

- Write down all the different types of hardware and software involved from when a user types in a web address such as [www.google.com](http://www.google.com) to the web site being loaded.
Figure 3.2  Physical and network infrastructure components of the Internet (Levels IV and III in Figure 3.1)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Enabling technology</th>
<th>Killer applications* and impact</th>
</tr>
</thead>
</table>
| 1     | Documentation: 3500 BC to AD 1452  
Written language and the development of clay tablets in Mesopotamia | Taxes, laws and accounting giving rise to the development of civilization and commerce |
| 2     | Mass publication: 1452 to 1946  
The Gutenberg press of movable metal type | Demand for religious and scientific texts resulting in scientific advances and ideological conflicts |
| 3     | Automation: 1946 to 1978  
Electric power and switching technologies (vacuum tubes and transistors) | Code breaking and scientific calculations. Start of information age |
| 4     | Mass interaction: 1978 to 1985  
Microprocessor and personal computer | Spreadsheets and word processing |
| 5     | Infrastructuralization: 1985 to 1993  
Local- and wide-area networks, graphical user interfaces | E-mail and enterprise resource planning |
| 6     | Mass communication: 1993 to c.2005  
Internet, World Wide Web, Java | Mass information access for communications and purchasing |

*Very useful applications which will encourage adoption of a technology.

Table 3.2  Six stages of advances in the dissemination of information
Figure 3.3 A five-layer model of e-business infrastructure

Figure 3.4 The Netcraft index of number of servers

Intranets and extranets

- **Intranet** is a private network within a single company using Internet standards to enable employees to share information using email and web publishing
  => *Information is limited inside the organisation*

- **Extranet** is formed by extending an intranet beyond a company to customers, suppliers and collaborators.
  => *Information access is extended to some others, but not everyone beyond the organisation.*
Intranet

• Intranets are used extensively for supporting sell-side e-commerce from within the *marketing function*. There are also used to support supply-chain management activities.

A marketing intranet has the following advantages:

  • Reduced product life cycles - we can get products faster
  • Reduced cost through higher productivity, and saving on hard copy
  • Better customer service – responsive and personalized support with staff accessing customers over the web.
  • Distribution of information through remote offices nationally and globally.

Intranet

• Intranets are useful for *internal marketing communications* since they include the following types of information:

  • Staff phone directories
  • Staff procedures or quality manuals
  • Information for agents such as product specifications, current list and discount prices, factory schedule, and stocking levels. These information have to be updated frequently and can be costly.
  • Staff newsletters
  • Training courses
Intranet

• With intranets and through web browsers we can access business applications which traditionally accessed using separate software programs.

=> This can help to reduce the **total cost of ownership**

• Total Cost of Ownership (TCO) is the sum of all cost elements of managing information systems for end-users, including purchase, support and maintenance.

Intranet

• With intranet a direct cost reduction can be achieved through reduced cost of printing and indirectly through reduced staff time needed to access information.

• It is required to enable staff to manage their own content. For large sites it is not practical to update the contents through a webmaster. A practical method is to provide the staff with access to a system allow them to add and edit web pages. Such system is known as **content management system**.

• **content management system (CMS)** is a software used to manage creation, editing, and review of web-based content.
Extranet

• *Extranet* is formed by extending an intranet beyond a company to customers, suppliers and collaborators. => *Information access is extended to some others, but not everyone beyond the organisation.*

• Extranets are used to provide online services which are restricted to business customers.
  – E.g. Buying a book online using an account with login and password.

Extranet

**Business benefits of an extranet:**

1. Information sharing in secure environment
   information is shared with suppliers through a login to a database

2. Cost reduction
   e.g. Through reducing the number of people involved in placing orders

3. Order processing and distribution
   e.g. Less lost sales because of out-of-stock items and lower inventory holding is needed

4. Customer service
   e.g. Distributors or agents of companies can find information such as customized pricing or advertising material
Extranet

Many of the management issues involved with managing extranets are similar to those of the intranet. These are five questions need to be asked when reviewing an existing or new extranet:

1. Are the levels of usage sufficient?
2. Is it effective and efficient?
3. Who has ownership of the extranet?
4. What are the levels of service quality?
5. Is the quality of information adequate?

Activity – a common problem with intranets and extranets

- The B2B Company has found that after an initial surge of interest in its intranet and extranet, usage has declined dramatically. Many of the warning signs mentioned in the KM (2002) article listed above are evident. The e-business manager wants to achieve these aims:
  1. Increase usage.
  2. Produce more dynamic content.
  3. Encouraging more clients to order (extranet).

- What would you suggest?
Suggested answer

- Identify benefits
- Involve staff with development
- Find system sponsors, owners and advocates
- Train on benefits
- Keep content fresh, relevant and where possible, fun
- Use e-mail to encourage usage.

Firewall is a software application mounted on a server at the point where a company is connected to the Internet. Its purpose is to prevent unauthorized access into the company from outsiders.

Demilitarized zone (DMZ)
In a DMZ configuration, most computers on the LAN run behind a firewall connected to a public network like the Internet. One or more computers also run outside the firewall, in the DMZ.

Figure 3.6  Firewall positions within the e-business infrastructure of the B2B company
Web browsers and servers

- **Web servers** store and present web pages accessed by web browsers.

- **Static web page** A page on the web server that is invariant.

- **Dynamic web page** A page that is created in the real time, often with reference to a database query, in response to a user request.

- **Transaction log file** A web-server file that records all page requests.
Web 2.0

Web 2.0 concept became popular in 2004. It refers to a collection of web services which facilitate certain behaviours online such as community participation and user generated content, rating and tagging.

**Characteristics:**

- Interactive applications: Flicker, Google maps, blogging services.
- Encouraging creation of user-generated contents: Wiki s
- Enabling rating of content and online services
- Ad funding of neutral sites: GMAIL, Google Adsense
- Data exchange between sites through XML-based data standards – RSS is based on XML
- Rapid application development using AJAX – Google map
URLS and domain names

- Web addresses are structured in a standard way as follows:
  - http://www.domain-name.extension/filename.html
- What do the following extensions or global top level domains stand for?
  - .com
  - .co.uk, .uk.com
  - .org or .org.uk
  - .gov
  - .edu, .ac.uk
  - .int
  - .net
  - .biz
  - .info
Web presentation and data exchange standards

- **HTML (Hypertext Markup Language)**
  A standard format used to define the text and layout of web pages. HTML files usually have the extension .HTML or .HTM.

- **XML or eXtensible Markup Language**
  A standard for transferring structured data, unlike HTML which is purely presentational.

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Figure 3.9: Home page index.html for The B2B Company in a web browser showing HTML source in text editor.
XML example

```xml
<Product>
    <Action Value="Delete"/>
    <ProductID>118003-008</ProductID>
</Product>

<Product Type="Good" SchemaCategoryRef="C43171801">
    <ProductID>140141-002</ProductID>
    <UOM><UOMCoded>EA</UOMCoded></UOM>
    <Manufacturer>Compaq</Manufacturer>
    <LeadTime>2</LeadTime>
    <CountryOfOrigin>
    </CountryOfOrigin>
</Product>
```

Media standards

- **GIF (Graphics Interchange Format)** A graphics format and compression algorithm best used for simple graphics
- **JPEG (Joint Photographic Experts Group)** A graphics format and compression algorithm best used for photographs
- **Streaming media.** Sound and video that can be experienced within a web browser before the whole clip is downloaded e.g. Real Networks .rm format
- Video standards include MPEG and .AVI
- Sound standards include MP3 and WMA
Managing infrastructure

- Managing hardware and system software infrastructure
- Managing the applications infrastructure.

Managing hardware and system software infrastructure

- Systems software – layer II
  - The key management decision is standardization throughout the organization.
    - this leads to reduced numbers of contacts for support and maintenance
    - reduce the purchase prices through multi-user licenses
  - Systems software choices occur for client, server and network
    - Client: which browser to standardize on, standardize plug-ins and system software
    - Server: standardize the web-server; eg. Apache, this can help maintenance
    - Network: networking software should be decided on; eg. Novell
Managing hardware and system software infrastructure

• Transport or network – layer III
  – Decisions on the network will be based on the internal company network.
    -> which e-business will be intranet
    -> for external network which will be extranet or VPN, or links to the public Internet
  – The main management decision is whether internal or external network management will be performed by the company or outsourced to a third party.
  – Standardization of hardware

Managing hardware and system software infrastructure

• Storage – layer IV
  – Storage can be managed internally or externally
  – e.g. intranet and extranet are commonly managed internally,
  – while Internet storage such as corporate website is commonly managed externally or at the application service provider
Managing the applications infrastructure

• E-business applications infrastructure:
  Applications that provide access to services and information inside and beyond organization

• Enterprise resource planning ERP applications:
  Software providing integrated functions for major business functions such as production, distribution, sales, finance, and human resources management.

Figure 3.10  (a) Fragmented applications infrastructure, (b) integrated applications infrastructure

Source: Adapted from Hasselbring (2000)
Figure 3.11  Differing use of applications at levels of management within companies

Figure 3.12  Elements of e-business infrastructure that require management
Activity – how would you respond

• You are e-commerce manager for the BBC.
• How would you evaluate your response to the launch of the 3G phone.
• That is which sources would you use to base your response on?

Figure 3.13 Mobile access technologies
Figure 3.14  Components of an interactive digital TV system