# CHAPTER 4: The Technological and Information Environment

## Key Review Points

### What is Technology?

Technology embraces mechanics, electrics, electronics, physics, chemistry and biology and all the derivatives and combinations of them. The technological fusion and interaction of these sciences is what drives the frontiers of achievement forward.

Business organisations should watch closely not only their immediate competitors but also emerging technologies.

### Technology and Society

Companies that anticipate, identify and successfully invest in emerging technologies should be able to develop a strategic advantage over the competition. As the demand-technology life cycle goes through the stage of rapid growth, they will grow with it. As growth slows and the cycle matures, competitors will find it increasingly hard to gain a foothold in the new and by now dominant technology.

Our lives are affected by the interaction between technological changes and the social, economic and political systems within which we live and work.

- **Technology and consumer adoption**

Models of technology adoption have their origins in the disciplines of psychology, information systems and sociology. The Technology Acceptance Model (TAM), based on the Theory of Reasoned Action has become well established as a model for predicting acceptance of new IT based services. The model (figure 4.3) introduces two specific beliefs that are relevant for technology usage.

Consumers in different parts of the world will have different priorities according to wealth and circumstances.

### Expenditure on Research and Development

R&D expenditure is often classified into three major types: basic, applied and experimental.

Classification is also often carried out on a sectoral basis, e.g. public or private, and by type of industry.

The United Kingdom is well down the international league table on expenditure.

Spending on Research and Development is not the only indicator of technological innovation. The number of patents registered in a country is also a reflection of a healthy R&D culture and advanced economy.

**Forecasting new technologies**

The UK Government has introduced the Foresight programme to try and identify future technologies. It aims to provide challenging visions of the future, and to develop effective strategies for meeting them.

**Impacts of technology on business operations**

The following are the number of themes for analysing the impacts of technology on business operations:

- **Product design and development**

It is argued that the life expectancy of products has tended to shorten as technology has advanced. The product life cycle (PLC) is a means of plotting sales and profits over time in such a way that different stages in the life cycle can be identified and appropriate marketing strategies thus applied.

Managing the development of new products is a complex and risky business.

In reality not all of the new product ideas come together and start the process at the same time. Ideas are generated at odd times and come from a wide variety of sources.

There are internal barriers to the adoption of new technology. Individuals may be resistant to change in the organisational setting. They may have a fear of new technology itself, or for their job, or the disruption that change may bring.

- **Manufacturing and Processing**

Technology impacts on manufacturing and processing systems, particularly in computerised numerical control (CNC) machine tools, computer-aided manufacturing (CAM), integrated manufacturing systems (IMS) and just-in-time (JIT) systems.

Generally speaking, modern manufacturing systems allow production lines to be run with greater flexibility and higher quality, making it easier to produce product variations and allowing a speedier change-over between products thus minimising down-time.

Developments in production technology present companies with a number of opportunities for gaining a competitive advantage.

- **Supply chain management**

The increased capacity and reliability of computerised data processing and storage combined with improved data transmission and computer-controlled physical handling systems have led to reductions in costs and improvements in service. It is now possible to hold less stock at all stages in the distribution chain for a given product variety.

As companies come to rely very heavily on IT systems, any problems in the system can have an adverse effect on logistical and financial operations.

- **Efficient consumer response**

Partnerships between producers and intermediaries are evident in the Efficient Consumer Response (ECR) initiative. This involves members of the total supply

chain working together to respond to customers' purchasing patterns, thereby ensuring the right products are delivered to store shelves at the right time.

- **Article numbering/bar codes**

Efficient response to consumer demands depends on each individual product having a unique code number and the equipment at the point of sale being able to read that number.

Manufacturers, retailers and other interested parties cooperated under the auspices of the global umbrella of GS1 to devise an article numbering system, to allocate numbers and set standards for the use of what have become known as 'bar codes'.

- **Point of sale, order and payment processing**

EPOS (electronic point of sale) systems allow each till to total the goods purchased by an individual and record the transaction in the normal way. In addition to the daily cash analysis, however, EPOS systems may provide stock reports and an analysis of sales figures, and improve control over each till and the staff using it.

EFTPOS (electronic funds transfer at point of sale) has all the benefits of EPOS plus electronic funds transfer.

- **Communicating with customers**

A number of long-term trends in the technological impacts on communication can be noted:

o A gradual proliferation of communication media available for companies to send messages to customers

o A long term reduction in the cost of communicating with customers

o The time taken to get a message to its audience has been reduced

o Communication has increasingly become interactive through the use of telephone and Internet, allowing companies to engage in a dialogue with customers

o Technology has allowed much more precise targeting of messages sent according to the individual's interests.

- **Managing customer relationships**

Customer Relationship Management (CRM) has become a generic term to describe processes that essentially seek to join up a company's customer focused information systems and to track dealings with individual customers throughout the relationship lifecycle.

CRM is defined as "the systems and processes used by an organisation to integrate all sources of information about a customer so that the organisation can meet individual customers' needs more effectively and efficiently".

The basic, but inter-related components of CRM can be described as:

- Data collection and management
- Customer analysis and profiling
- Computer aided sales support
- Customer information and service

- **Performance measurement**

Measurability is an inherent aspect of IT applications in business and has led to a change in organisational culture since measurement of targets, processes and outcomes is key. Efficiency and effectiveness are easily measured through IT.

Shared information through a distribution channel can also help to improve each member's measurement of business performance. Intermediaries can conduct direct product profitability (DPP) analysis of individual terms through the use of EPOS data. DPP attempts to identify all the costs that are attached to a product or an order as it moves through the distribution channel.

- **Technology and the ecological environment**

In many people's minds, technology may be associated with ecological problems.

The harmful ecological consequences of industrialisation are not confined to western countries during their periods of rapid industrial development. While many countries have restricted certain technologies because of their harmful effects on the ecological environment, rapidly developing economies have lower standards of ecological protection; which obliged some manufacturers to use their production processes in these places.

Whether a technological development is good or bad for the environment can be the subject of endless debate, with certain facts often being mixed with personal and political prejudice. Debate over nuclear power typifies this dilemma.

- **The Internet and Electronic Business**

One underlying theme of the development of electronic business has been the reduced cost of handling transactions electronically, rather than through paper-based systems. Alongside this, the speed of communication has allowed business to be transacted much quicker, and the data generated through electronic business systems has given managers a much better understanding of the marketing and operational aspects of their organisation.

- **The Internet**

The internet, or World Wide Web (www), is an open system that anyone can access via a computer and a modem.

Soon websites were developed which provided more information and eventually led to the development of interactive sites. With the development of protocols for encoding financial and other sensitive information, the Internet can now be used to purchase services and products using a credit card.

In business-to-business channels, the Internet (and intranets and extranets) has replaced previous Electronic Data Interchange (EDI) systems for handling transactions between businesses.

I Intranet systems are private internal systems (as opposed to open and public systems) constructed using Internet technology. They are internal to an organisation and can be accessed and used only with permission and passwords. A company's intranet system can link together an organisation that is geographically dispersed and facilitate links between an organisation and its business partners such as suppliers and distributors. Such a system is often described as an 'extranet'.

The deregulated nature of the Internet, operating across international boundaries, has posed new challenges as it developed from an information service, to a promotional tool, and finally a sales and distribution channel. Concerns have been

expressed in four areas: confidentiality of individual information; consumer protection for those purchasing goods and services; under which legal system a transaction takes place; and concern over the difficulty of governments collecting sales taxes.

- **The EU and the development of a knowledge-based economy**

At the 2000 summit of EU leaders held in Nice, leaders stated their intention for Europe 'to become the most competitive and dynamic knowledge-based economy in the world'. A programme of action included the creation of a fully integrated and liberalised telecoms market by the end of 2001; a single market for financial services by 2005; making all EU public services, including tenders, available on the Internet; an EU regulatory framework and common security standards for e-commerce; connecting all schools and training centres to the Internet; and creating an IT 'passport' of specific skills.

However, a report by the consultancy group Gartner identified four pressing challenges for the EU in its attempts to create an e-commerce friendly environment.

- **E-retailing**

The trend towards direct delivery from producer to consumer has been speeded up by the growth of Internet access. As a communication medium with customers, email (and SMS text messaging) extends the profiling and interactivity features of direct mail.

However, while the Internet may facilitate direct communication between producers and end-consumers, the chances of dialogue actually taking place are lessened by the proliferation of content on the Internet, which presents a bewildering array of choice to consumers. The response has been the development of a new breed of information intermediary, or 'infomediary'. This type of channel intermediary gathers information about customers and sells access to them to companies seeking to promote their products. The new generation of infomediaries has effectively become a new form of value-adding member in a virtual value chain. Consider also the effects of "Web 2.0" and the dialogue that takes between customers themselves.

- **Data Security and Privacy**

While much of this development has been beneficial to companies and their customers, some commentators have pointed to more harmful consequences for personal privacy and security.

Data protection has become a very big issue, as it is not just companies who can easily collect and manipulate information, so too can criminals. There is also concern by some consumers that their personal data may be misused, if not in a criminal way, certainly in a way that they would consider unethical.

Unfortunately, unauthorised people may be able to access personal information held on databases.

Where a company is dependent on online transactions for the bulk of its revenue, the effects of such malicious intrusions can be devastating, not only resulting in a short-term loss of revenue, but long-term harm to its brand reputation where customers' details are obtained or used in an unauthorised way. In designing the online environment, companies must strike a balance between making a site easily accessible to all, and difficult for those with malicious intentions.