SOLUTIONS MANUAL

Business Information Systems

fourth edition

Technology, Development & Management

Paul Bocij Andrew Greasley Simon Hickie

Basic concepts – an introduction to business information systems

Activities

Activity 2.1

What information systems might be found in your newsagent's? For each system identified, list the people, hardware, communications, software and data resources involved.

Examples of the kinds of systems that might be found include those indicated in the table below. Note that the lists given contain a limited number of examples and are not intended to provide a comprehensive solution.

Resource requirements needed for different systems in a newsagent

Resources	Billing system for newspaper deliveries	Stock control system for other items sold in store	National Lottery (Lotto) ticket sales system
Hardware resources	Personal computer, printer	Personal computer, printer	Specialised terminal with integral printer, communications equipment (e.g. modem and leased telephone line)
Software resources	Billing software (will include facilities for data entry and a variety of reports, e.g. account details for individual customers, summary reports etc.) Backup software	Stock control software with facilities for recording sales and deliveries. Software may also account for invoices paid and received. Package will also produce a variety of reports, e.g. stock for reorder, summary of sales etc.	National Lottery terminals use specialised software that produces tickets, records sales and carries out other functions, e.g. 'lucky dip' tickets, where numbers are selected at random
Data resources	Supplier data, e.g. newspapers and magazines delivered each week. Customer information, e.g. new orders and cancellations. Data from delivery people, e.g. customers, who have or have not paid	Supplier details, e.g. contact information, price lists, stock availability etc. Records of sales. Records of current stock held. Financial data, e.g. whether or not the newsagent can afford to buy given items of stock	Time and date (restricts times when tickets can be sold). Customers' selections (of numbers). Records of previous draws (for awarding prizes etc.)

People resources	Newsagent, customers, delivery people, suppliers (i.e. distribution company), sales staff, suppliers of equipment (for support etc.)	Suppliers, sales staff, suppliers of equipment (for support etc.)	Sales staff, suppliers of terminal equipment (for support etc.)

Activity 2.2

Using the Internet as a resource, locate at least two examples of the use of online processing systems in business. As an example, both Sainsbury's and Boots use incentive programmes based on loyalty cards, in which customers can redeem points against purchases using interactive kiosks.

This is a relatively simple task that is intended to make students appreciate the extent to which such systems are used. Some examples that students might identify include these:

- The ATMs provided by banks and other financial institutions.

- The electronic tills used by supermarkets that can accept payment by credit card or Switch.

- Many retailers use inventory control systems that monitor stocks across a number of stores. These systems are capable of automatically reordering items when stocks fall below certain levels.

Activity 2.3

Consider the framework of the Internet economy developed by the CREC (Center for Research and Electronic Commerce) at the University of Texas. Give at least three examples of companies for each layer in the framework.

There are four layers in the framework. CREC describes these layers like this (see http://itc.mit.edu/itel/docs/2002/Internet_Map.pdf):

- Internet infrastructure: including telecommunications companies, Internet backbone providers, Internet service providers (ISPs) and other last-mile access providers.

- Internet applications infrastructure: principally, software required for Internet services, but also consulting and service companies hired to build web sites.

- Internet intermediary: economic activity at the intermediary level includes service provided by auction and aggregation providers – companies that package or provide a forum for economic activity, though they may not be involved in the activity itself.

- Internet commerce: finally, the commerce layer includes companies that are engaged in sales and transactions over the Internet.

Typical examples of internet infrastructure companies include: British Telecom (ISP and telecommunications), AT&T (Internet backbone providers), AOL (ISP and backbone provider) and Cisco Systems Inc. (hardware manufacturer).

Typical examples of applications infrastructure companies include: Microsoft (producers of operating systems and web server, Internet Information Services [IIS]), Apache Software Foundation (producers of Apache web server) and Sun Microsystems (developers of Java and other critical hardware/software).

Typical examples of Internet intermediaries include eBay (auction site), Expedia (online travel), CNET (content aggregators) and Google (portal and content aggregators).

Typical examples of Internet commerce include Amazon (e-tailer), Dell (hardware manufacturer selling online) and iTunes (online entertainment).

Activity 2.4

The approaches used by companies such as Argos, Dell and eBay restructure the relationship between manufacturer, retailer and customer to the benefit of all involved. Discuss this statement with reference to the e-business and e-commerce concepts described in this section.

This activity asks students to identify some of the key benefits of e-business. Some typical benefits students might be expected to identify are given below.

Manufacturer	Retailer	Customer
Can achieve economy of scale even with niche products because more retailers to work with	Larger range of products to offer customers	Larger range of products to choose from
Reduced production costs through better access to raw materials, larger choice of suppliers etc.	Can reach customers almost anywhere; no physical restrictions	Can access products and services from almost anywhere; e.g. UK buyer can buy from USA
Can reach customers directly; quick feedback on products, easier to provide support etc.	Can provide customers with improved customer support through web site, e-mail etc.	Competition acts to reduce prices
Can sell directly to customers	Reduced costs through improved processes, e.g. online payment systems	Easier to reach manufacturer for information and support

Case Studies

Case Study 2.1: Volvo trucks' valuable early warning system

1. What are the benefits of Volvo's warranty management system?

2. In general, how does the warranty management system help Volvo to be more competitive?

---

1. The case study attributes a number of benefits to the system:

   - Customer satisfaction is higher because warranty issues are handled efficiently and quickly.

   - Fewer resources are needed when handling the repair.

   - Goods can be turned around more quickly.

   - Information from the system can be used to improve products.

   - The company gains a good reputation for its warranty support. This may also allow prices to be raised in some markets, increasing profits.

   - The system makes it easier to identify certain kinds of problems, e.g. when certain parts are used in combination.

   - The system helps to identify potential faults before they occur (trend analysis). This helps to lower costs and keeps vehicles running for longer.

   - The system increases customer choice by allowing trucks to be produced to customers' specifications.

   - The system helps Volvo's design and manufacturing teams react to after-market problems with the trucks and prioritise design or production changes.

   - Warranty costs are reduced by up to 50% – this increases profits and allows more competitive pricing.

   - The system provides information that can be used to identify potentially fraudulent claims.

   - Information from the system can be given to suppliers, improving business relationships while helping the suppliers to improve their products.

2. Companies can gain an edge over their competitors in several ways. The case study shows that Volvo's warranty management system has allowed them to use four main approaches:

Making your products stand out. Building a reputation for good customer service allows Volvo to distinguish itself from other truck manufacturers. The case study notes that some people are prepared to pay high prices in exchange for good warranty support. Volvo also distinguishes its products from other truck manufacturers by allowing customers to build trucks to their own specifications.

Reducing costs so that prices can be lowered. The system allows warranty costs to be reduced by up to 50%.

Creating innovative products and services. The system helps Volvo's design and manufacturing teams react to after-market problems with the trucks and prioritise design or production changes. This means that improvements to products can be made very quickly, allowing the company to stay ahead of competitors.

Making links with customers, suppliers etc. Giving information from the system to suppliers helps to build strong business relationships; being Volvo's business partner provides access to information that allows the supplier to improve its products at a low cost.

Case Study 2.2: Airport check-in: board your flight by mobile phone

1. What are the advantages and disadvantages of mobile check-in?

2. How does being one of the first companies to adopt technologies such as mobile check-in confer competitive advantage? Refer to the concepts covered in *BIS and Strategic Advantage* in your answer.

3. What barriers are there to the widespread adoption of mobile check-in?

---

1. This question is intended to encourage discussion. Some points students might consider include:

Advantages

- Convenient, e.g. no need to carry tickets, text message reminders etc.

- Self-service approach reduces costs for airlines. Can also be faster, more convenient etc. for travellers.

- Easier for passengers to change seat selection, check-in etc.

- Advanced services (e.g. Skip) allow passengers to skip check-in.

Disadvantages

- Must have a mobile phone to use service.

- Susceptible to problems like dead batteries, broken phones etc.

- Some people will not want to use service or will be unable to use it, e.g. elderly.

2. This question asks students to apply concepts covered in the chapter to the case study. In brief, some of the points that might be made include the following:

The introduction of mobile check-in as a new service offered by airlines is a good example of *product innovation*. Being an early adopter of the technology may encourage further innovation because the company will have a lead with regard to developing new products and services (e.g. the Skip service).

Until every airline offers the service, companies like Finnair can *differentiate* their products.

Since mobile check-in helps to automate the process checking in, producing boarding passes etc., companies using it can realise a *cost reduction*.

Being one of the first companies to offer mobile check-in provides an opportunity to form *strategic alliances* with other companies, such as mobile phone operators. This will help to raise *entry barriers* since companies wanting to offer mobile check-in later on will have to invest in the necessary technology, make their own alliances with mobile phone operators and so on.

3. The case study describes several possible barriers:

- Governments may need to pass/alter legislation allowing mobile check-in and related services to be used legally.

- Agreements will need to be reached with all major airport authorities to allow mobile check-in and related services to be used (e.g. airport authorities require paper boarding passes to be used).

- Standards will need to be developed/agreed for use of mobile check-in.

- Mobile devices need to have the required features by default so that customers do not need to install software.

- Mobile phone operators will need to change their pricing policies to make the service affordable.

Three factors not mentioned within the case study should also be considered:

- The security implications of mobile check-in will need to be evaluated; making it easier for people to skip or cut down various parts of the check-in and boarding processes may impact on security.

- The use of mobile check-in depends on the majority of passengers owning mobile phones. In poorer regions of the world, not everyone owns a state-of-the-art mobile phone.

- Some people will be unable/unwilling to use the service (e.g. disabled, elderly).

Exercises (pp. 59–61)

Self-assessment exercises

1. Answer the following questions in relation to your college or university:

(a) What are the institution's objectives?

(b) Identify a range of typical inputs, processes and outputs.

(c) What feedback mechanisms are in place and what kinds of information do they produce?

(d) What control mechanisms exist?

(a) The institution's mission statement provides a summary of aims and objectives. As an example, the following statement – or one very much like it – is likely to be found in many college and university literature:

The University of XXX exists to provide equal access to quality education for all students.

Such a statement can be broken down as follows:

- Although this may seem obvious, as a whole, the statement suggests that the primary purpose of the institution is to deliver education and training. However, this statement also suggests activities that the college or university will *not* undertake. In an established college or university, for example, such a statement would imply that research is considered secondary to teaching.

- The term 'equal access' implies that one objective of the institution is to cater to the needs of all students, irrespective of gender, ethnicity, religious beliefs or age. Furthermore, the use of the word 'access' suggests a proactive approach towards recruiting students. In other words, the institution aims to *create* opportunities for students to study.

- The term 'quality education' implies that the institution will seek to ensure that the highest standards of teaching and learning are maintained. Obviously, such a statement is made within certain constraints, such as budget.

(b) Students should be encouraged to take a methodical approach to the task and should attempt to link items together. Although the table below contains only a small set of examples, it illustrates the approach that should be taken.

Inputs and outputs for the different processes in a college or university

Process	Inputs	Outputs
Enrol students	Student information (e.g. individual names, choice of course) Course information (e.g. places available)	Record of all students enrolled on course Statistics for internal use Statistics for government use
Student induction	Timetable for course Availability of facilities (e.g. rooms) Questionnaires etc. for gathering information on students	Programme of induction events Feedback on induction programme
Join library	Student's enrolment details Student's course details	Student's library account

A college or university will have a large range of feedback mechanisms relevant to the wide variety of processes that take place in a typical institution. Some examples are listed:

- Enrolment data will be processed so that managers can carry out tasks such as identifying courses for which the recruitment has not been good.

- Student representatives will provide feedback information concerning individual modules and courses.

- The National Union of students (NUS) will regularly provide feedback information to the institution concerning the welfare of students; for example, the NUS will represent the students with their grievances against the institution.

- All institutions will have internal quality committees that deal with issues ranging from the quality of teaching to the condition of the institution's buildings.

There will also be a wide variety of different control mechanisms in place. Some examples include the following:

- Poor recruitment figures might be rectified by spending more on advertising, or altering the hours of the course (so that it becomes more accessible to certain groups).

- Complaints concerning student grades might be dealt with via a course committee meeting, where a new marking scheme might be introduced, or additional cross-marking is recommended.

- A need to repair buildings or acquire new equipment might be met by adjusting budgets.

(c) and (d) Ideally, students will come to link the answers to (b), (c) and (d) as shown in the example in the table below.

Inputs and outputs for the recruit-students process related to feedback and control components

Process	Inputs	Outputs	Feedback	Control
Recruit students	Students (and student data) Finance (for advertising etc.) Staff (for student guidance etc.) Rooms (for enrolment etc.)	Advertising Enrolment figures	Enrolment statistics Market research	Increase advertising Alter course times

2.   In what ways can information systems support a manager's activities?

At the simplest level, students should recognise that information systems help managers to make better decisions by providing information of high quality.

A more comprehensive answer might link the functions of management with managerial decision making and the attributes of information quality. An example is given below:

Planning	>>	Information systems can be used to plan projects by providing information for forecasts etc. However, the information will only be useful if it is relevant, accurate, timely etc.	>>	Managers can make more effective decisions regarding how the project is structured, with the result that the project is more likely to succeed.

3.   How can computer-based information systems help an organisation achieve a strategic advantage over its competitors?

Students are asked to recall the basic competitive strategies of cost, leadership, product differentiation and innovation. However, a more thorough response will include this list:

- improving operational efficiency

- raising barriers to entry

- locking in customers and suppliers

- promoting business innovation

- increasing switching costs

- leverage.

4. Match each term to the correct statement.

Solution:

1. input   –   examples include raw materials, energy or labour power

2. process   –   converts raw materials into a finished product

3. output   –   examples include information, a product or service

4. feedback   –   provides information concerning the performance of a system

5. control   –   adjusts the performance of the system

6. boundary   –   defines the scope of the system

7. environment   –   contains everything outside of the system

8. interface   –   describes exchanges between the system and its environment

5. What is the virtual value chain?

The virtual value chain (VVC) extends Porter's concept of value chain analysis to the Internet. Where Porter's value chain generally deals with the production, marketing and supply of physical products, the VVC is concerned with producing and marketing non-physical products, such as subscription-based services.

Key concepts associated with the VVC are:

- the *marketspace*, the virtual equivalent of the marketplace;

- the argument that information can create new value for customers (i.e. it has more value/benefit than simply supporting primary/secondary activities);

- a process whereby companies move through three phases when adopting the VVC, ultimately transforming them in fundamental ways. The phases are visibility, mirroring capability and new customer relationships. In brief, companies begin by examining and altering physical processes (visibility) before replacing them with virtual processes (mirroring capability) with a view towards using information to deliver value in new ways (new customer relationships).

6. What are transaction costs?

Transaction costs describe all of the costs associated with carrying out business transactions. As an example, choosing and then paying for an item by debit card incurs a number of costs for the retailer. These might include the cost of maintaining a showroom, staffing, advertising, bank charges imposed for processing payments and so on. A typical transaction cost for making or receiving a payment via a debit card might be as much as 3% of the value of the transaction.

One of the key business benefits of the Internet is that it acts to reduce transaction costs. It is also possible to pass some transaction costs on to customers. As an example, a retailer like Amazon has low transaction costs because it has no physical sales branches, no salespeople and so on. This allows the company to pass discounts on to customers.

7. Explain the reasons for the adoption of enterprise resource planning (ERP) systems by organisations.

ERP provides a single package that replaces a number of separate packages. This allows better integration between modules and simplified support and maintenance. The ERP system typically supports several functional areas or different parts of the value chain such as inbound logistics, manufacturing, distribution, sales and finance.

Discussion questions

1. Can each of the following be described as a system? For each item, try to identify at least two inputs, processes and outputs. In addition, what feedback and control mechanisms exist?

- **a human being**

- **a plant**

- **a house**

- **a country**

- **a computer.**

The table below summarises the inputs, processes and outputs for the items listed in this question. The list is intentionally contentious – a great deal depends on how students interpret each item. Some examples of the points students might make are given in the accompanying table. Brief notes concerning each item are also given.

Inputs, processes and outputs for different systems

Item	Inputs	Outputs	Processes	Feedback	Control
Human being	Food Water Oxygen	Carbon dioxide Waste products	Respiration Nourishment	Autonomic (body recognises need for more oxygen) Hunger pains	Increase breathing rate. Ingest food
Plant	Water Minerals Sunlight	Oxygen Fruit/seeds	Photosynthesis Hibernation	Autonomic (plant recognises need for nutrients) Autonomic (plant recognises changes in climate and temperature)	Plant orientates towards sunlight Plant varies intake of nutrients (for storage etc.), leaves shed (not required)

House	Utilities (gas, electricity etc.) People	Heat and light	Heating and lighting	Lighting manual, heating by thermostat	Thermostat
Country	People Money Labour Produce	Money Foods	Directing resources etc. Controlling population	Voting Opinion polls	Elections Legislation
Computer	Electricity Software Data	Screen displays Printed documents	Running a programme Controlling performance	Messages from operating system Commands from user	Operating system User

- *Human being*. Generally recognisable as a series of interconnected systems. The digestive system, for example, takes in food (input) in response to a sense of hunger (feedback). The food is digested (process), resulting in energy and waste products (output). The time when a person eats and the amount eaten (control) depend on the sense of hunger.

- *Plant*. Generally recognisable as a series of interconnected systems. Some plants, for example, reproduce (process) by creating seeds (output) by making use of stored energy and minerals (input). The plant recognises the time to reproduce by changes in the weather (feedback) and other factors. The number of seeds produced (control) will vary according to the plant's health and the availability of nutrients.

- *House*. It is difficult to consider a house in terms of a system since feedback and control mechanisms cannot be easily identified. One would need to stretch several points in order to form an argument. For example, one could argue that an output might be 'shelter' and a process could be 'provide shelter'. However, such an argument would be tenuous at best.

- *Country*. Whether or not one considers a country to form a system depends heavily on how the task is interpreted. If a country is considered in terms of a society, then it is possible to form a convincing argument by considering processes such as managing the behaviour of the population.

- *Computer*. A computer clearly possesses all the components of a system. Students often find it difficult to identify feedback and control elements and may need additional guidance. The examples given in the table may need a little more explanation in order for students to understand them fully.

- Users form part of a feedback mechanism where they issue commands. As an example, when word processing, using a menu command or typing text represents feedback since the user is responding to one or more outputs from the word-processing software (and vice versa).

- The operating system constantly provides feedback information to the computer; for example, messages will be sent each time a disk drive is accessed to inform hardware (and software) that data is about to be written or read.

- Hardware devices also provide feedback. Modern computers often feature temperature control systems, where sensors constantly monitor the temperature of the microprocessor.

It may also be appropriate to provide students with several examples of control mechanisms:

- In the case of temperature control systems, control activities can take several forms: a fan might be switched on automatically to reduce the temperature; the microprocessor may be set to 'idle' (slowing down the microprocessor acts to reduce its temperature) or the entire machine may be turned off automatically.

- Users can also exert control over a computer system. Cancelling a task such as writing a file to a floppy disk, for example, is a method of control.

- Operating systems perform a number of control activities. For example, all operating systems manage the computer's resources, such as deciding how memory is allocated to a given task.

2. A small company is considering the purchase of a computer and accounting software to help it keep track of its finances. In general, what are the benefits of processing by computer? What other benefits might the company gain by taking this step?

Students should recall these major benefits. In brief, these are:

- *Speed*. Computers can process millions of instructions each second, allowing the students to complete a given task in a very short time.

- *Accuracy*. The result of a calculation carried out by a computer is likely to be completely accurate. In addition, errors that a human being might make, such as a typing error, can be reduced or eliminated entirely.

- *Reliability*. In many organisations, computer-based information systems operate for 24 hours a day and are only ever halted for repairs or routine maintenance.

- *Programmability*. Although most computer-based information systems are created to fulfil a particular function, the ability to modify the software that controls them provides a high degree of flexibility. Even the simplest personal computer, for example, can be used to create letters, produce cashflow forecasts or manipulate databases.

In addition, a more comprehensive response will highlight some of the disadvantages of processing by computer.

Students should also refer to material on competitive advantage. Although this material should indicate how the company can gain a competitive edge, it should also indicate additional benefits to the company. For example, the material on cost leadership should suggest cost reduction as another benefit of computerisation.

3. Locate an annual report or article that describes a large organisation, such as a supermarket chain. From the information contained in the annual report, identify and describe the information systems that the company might use.

For this type of question, the aim is for students to carry out a detailed and methodical analysis of a major organisation.

Students should be able to identify specific kinds of information systems throughout the entire organisation. For example, in a supermarket chain, the analysis might begin with the electronic tills used in individual stores, moving through areas such as logistics (systems for stock control, deliveries etc.) and end with a discussion of the decision support systems used by top managers (e.g. modelling, simulation etc.).

Ideally, students should highlight and describe key areas of technology in order to demonstrate their understanding. Example is that while considering a supermarket chain, one would expect a student to pay a great deal of attention to EPOS (electronic point of sale) technology.

Perhaps the most important areas for students to consider are the complex relationships and interdependencies between the information systems used. For example, in the supermarket chain, the implementation of EPOS (in the form of electronic tills) is of major importance to areas such as stock control, the management of cashflow and the selection of product lines. In more formal terms, the student should recognise that the outputs produced by the systems used on the shop floor (that is, the operational level) form the inputs for systems used in other parts of the organisation (the tactical and strategic levels).

A good response might also consider the attributes of information quality relevant to each of the systems examined. In the case of a supermarket chain, it should be obvious that the accuracy of information produced at the operational level has a major impact at the tactical and strategic levels of the organisation. If the information produced is inaccurate, this will influence the quality of any decisions taken at these levels.

4. **Discuss the following statement with reference to how an organisation should react to the Internet. '*Is the Internet a typhoon force, a ten times force, or is it a bit of wind? Or is it a force that fundamentally alters our business?*' (Andy Grove, Chairman of Intel).**

Suggested approach:

This statement is useful in that it indicates that the impact of the Internet will vary according to the type of business that an organisation is in. Students should look at a range of industries from those where the impact is high, e.g. media and information services to those where the impact is low, e.g. retailer. Examples can be taken from those that have reacted, e.g. easyJet or General Electric in comparison to those that haven't. The analogy may also be apt, since the Internet phenomenon may be transitory. This can also be considered.

5. **'Enterprise resource planning software is likely to replace packages used in a single area of the organisation, such as accounting, logistics, production and marketing.' Discuss.**

ERP is likely to be restricted to larger organisations due to the cost of customisation of the software for the client. Mass-produced and, thus, cheaper, off-the-shelf packages are likely to be the most suitable option for the small organisation. Enterprise resource planning (ERP) software is a single system that gives applications for all the major business functions discussed in this chapter such as production, distribution, marketing and sales, finance and human resources management. It is normally purchased as an off-the-shelf package, with modules for each major business process or business function that are tailored by a consultant. A single package typically replaces many different previous packages. The benefits of this approach include:

- reduced cost of buying from a single supplier;

- better transfer of information within the organisation since all the modules of the system are compatible;

- simplified support and maintenance through a single supplier;

- use of 'best-of-breed solutions' employed by other companies.

The main disadvantage of the use of ERP systems seems to be the high costs charged by suppliers due to the demand for this type of system. This high demand has also given rise to skills shortages. The other disadvantage of ERP systems is shared with all off-the-shelf systems, namely, that the business often has to change its processes or way of working in order to fit the way the software works. This may not present a problem if a company is looking to re-engineer its processes since, then, the ERP software can provide a framework.

Owing to the high cost of ERP solutions, only large companies can afford the cost of the software and the consultants, which will often be measured in millions of pounds. Smaller companies can take advantage of the features of integrated accounting packages that now provide modules beyond those of the basic accounting package.

In summary, there is overwhelming evidence that ERP will replace functional applications in large organisations. In smaller organisations, the role of ERP applications is likely to be assumed by integrated accounting packages with similar functions.

Essay questions

1. **Use the Internet to research the SABRE system produced by American Airlines. This system demonstrates how BIS can be used to gain strategic advantage. Provide an analysis of this system. Your response should include discussion of the following areas:**

(a) **Describe how the overall approach adopted by American Airlines incorporated the basic competitive strategies of cost leadership, innovation and product differentiation.**

(b) **In what ways did SABRE provide American Airlines with a competitive advantage? Your analysis should refer to concepts related to the strategic use of information systems, for example, entry barriers.**

(c) **Although SABRE was undoubtedly successful, American Airlines was not able to maintain its competitive advantage beyond the late 1980s. What factors played a part in the erosion of the company's lead over its competitors and how did the company react?**

(a) Some of the following points might be made:

- *Cost leadership.* The use of an electronic booking system provides highly detailed and accurate information related to a wide variety of areas. For example, information concerning reservations can help the company to make the most efficient use of resources. The use of an electronic system also helped reduce transaction costs. For example, by allowing travel agents to deal with bookings, the company reduced costs related to activities such as issuing tickets and managing the number of available seats on each flight. The material given for Essay Question 2 in Chapter 1 is also of relevance here.

- *Innovation.* It is clear that SABRE itself was an innovation in terms of handling airline reservations. In addition, providing the system free of charge was a bold step in terms of the established business practices used at the time.

- *Differentiation.* The wide adoption of SABRE helped to differentiate the company's products (flights) from those of its competitors. One can see that a travel agent's use of SABRE implied endorsement for the company's flights. In addition, since the company's flights were always displayed first, this would tend to enhance its reputation.

(b) Some areas that might be considered include the following:

- *Entry barriers.* Few competitors would be able to afford the cost of developing a system to rival SABRE. Fewer still would have the resources needed to supply and install the system free of charge across the entire country. In addition, since many travel agents had already adopted SABRE, competitors would face the daunting task of convincing them to change to a new system.

- *Switching costs.* As SABRE established a *de facto* standard for airline reservation systems, competing airlines would need to bear the cost of ensuring that their information systems were compatible. Similarly, travel agents would be reluctant to turn to a competing system since this would involve a great deal of expense. For example, in addition to expenses such as staff training, a travel company might suffer costs from reduced efficiency while the changeover took place.

- *Operational efficiency.* As mentioned in a previous section, the detailed information available via SABRE could be used to reduce costs and improve operational efficiency in a variety of ways. The example was given earlier of reducing transaction costs by allowing travel agents to deal with the bulk of each business transaction.

- *Lock in customers and suppliers.* Again, as mentioned in a previous section, the expense involved in adopting a new system acted to lock in the company's customers (travel agents).

(c) This is a broad topic where students might propose a wide variety of possible explanations. Although it is difficult to pinpoint a specific cause, a fairly coherent argument can be made by considering a number of related points:

- It might be argued that American Airlines failed to invest sufficiently in the further development of SABRE and the systems produced afterwards. This allowed competitors to put forward alternatives to SABRE that seemed more attractive to travel agents.

- Reduced hardware and software costs enabled other companies to develop competing systems relatively quickly and cheaply.

- As more and more competitors adopted sophisticated information systems, they were able to realise many of the benefits enjoyed by American Airlines, such as increased operational efficiency. This served to diminish the company's competitive advantage.

- It might be argued that the company focused efforts on its core business activities, failing to diversify enough to offset losses when the demand for flights diminished. In terms of competitive strategy, it can be suggested that the company was unable to maintain an advantage because of a reduced emphasis on business innovation.

In terms of how the company reacted to the changes it experienced, the following points are worth considering:

- Initially, it appeared that the company did very little to re-establish its competitive edge. It can be argued that the company became somewhat complacent and failed to react in time to the actions of competitors and changes in the market.

- Although an improved bookings system was eventually developed, this did not have the same impact as the launch of SABRE. It can be argued that a number of factors, including those outlined earlier in this section, were responsible for this.

- In the early to mid-1990s, American Airlines no longer held the competitive position it had enjoyed for almost a decade. Although still basically profitable, the company had a reduced size and no longer dominated the market.

- Students should be encouraged to undertake a little research so that they can report the current position of American Airlines.

2. Select an organisation you are familiar with. You may choose a department within a large organisation, if you wish. Analyse the structure and behaviour of the organisation using systems concepts. Your response should include the following elements:

(a) Identify and describe at least two examples of the following: inputs, processes, outputs, feedback and control.

(b) Identify and describe two decisions that will be taken at the strategic, tactical and operational levels of the organisation.

(c) For each of the decisions described, identify at least two items of information that may be required. Describe some of the characteristics that each item of information will have.

(a) This question is quite similar to Question 3 in the Discussion questions section. It may be worth using both questions together in order to reinforce understanding of the topics covered. The discussion question, for example, might be used in a tutorial session as a preparatory exercise prior to students tackling the essay.

For the purposes of this section, we will use a supermarket chain to provide suitable examples.

The examples chosen should be clear and unambiguous (see table below). At this level, some fairly simplistic responses would be acceptable, providing they were logical and consistent.

	Example 1	**Example 2**
Inputs	• Products • Pricing information	• Demand for products • Stock levels
Processes	• Selling goods to customers	• Managing stock held at branch
Outputs	• Information on sales, e.g. weekly totals • Profit realised after expenses	• Orders for products with low stock • Details of products that are overstocked
Feedback	• Returns of faulty or inappropriate products • Customer demand for certain products	• Demand for products • Stock checks
Control	• Increased quality checks • Sales and special offers to reduce stocks	• Adjusting reorder levels • Using alternative suppliers for certain products

(b) The examples chosen should be clear and unambiguous (see table below).

	Decision 1	Decision 2
Operational	Daily staff levels for an individual branch	Price reductions for products that must be sold by a certain date
Tactical	Selection of suppliers for given products	Advertising (could also be operational or strategic, depending on scale)
Strategic	Whether to open one or more new branches in a given area	Diversification, e.g. providing additional services such as banking facilities

Some responses may need to be clarified and students should attempt to do this whenever required. As an example, the scale of the activity would need to be made clear in the 'Advertising' decision given in the table above.

(c) Using the examples given for (b), any of the following items in the table would form an acceptable response:

	Decision 1	Decision 2
Operational	• Staff absences for the day • Availability of staff to cover for absence	• Quantity of item in stock • Price of item
	• Minimum staffing levels needed for efficient operation	• Profit margin (to determine lowest possible selling price)
Tactical	• Reputation of supplier • Location of supplier	• Cost of advertising • Most effective medium for advertising
	• Supplier's prices	• Details of offers etc. to include in material
Strategic	• Location of competitors' branches • Availability of land • Availability of local employees • Size of potential local market	• Competitors' plans • Market research information, e.g. if customers likely to take up service • Set-up costs

3. Draw a diagram illustrating the subsystems occurring in a hospital. Label the inputs and outputs of each subsystem. Which subsystems are most closely coupled?

A hospital is similar to any other kind of organisation in that many of the same functions are performed. For instance, a hospital will recruit and train personnel, issue payments, order goods and so on. The diagram produced can take any form, providing that it is clear and easy to understand.

For the purposes of this question, students should be directed to focus on areas such as patient care. When identifying the subsystems that are likely to be most closely coupled, students might consider some of the following activities:

- *Inventory control*. As medical supplies are used up, new stocks must be ordered. As many medicines are perishable, care must be taken to order medicines and other supplies only when they are needed.

- *Blood bank*. Similar to the previous point.

- *Staffing levels*. The personnel department (or 'function') must ensure that adequate numbers of appropriately trained staff are available at all times.

- *Admissions*. Medical staff may need to keep track of when patients are discharged or admitted so that they can admit new patients when necessary, making sure that enough beds are available at all times.

4. **Do you believe that the advantages of enterprise resource planning applications outweigh their disadvantages? Illustrate your answer with reference to company examples.**

The benefits of enterprise resource planning (ERP):

- reduced cost of buying from a single supplier;

- better transfer of information within the organisation since all modules of the system are compatible;

- simplified support and maintenance through a single supplier;

- use of 'best-of-breed solutions' employed by other companies.

The main disadvantage of the use of ERP systems seems to be the high costs charged by suppliers due to the demand for this type of system. This high demand has also given rise to skills shortages. The other disadvantage of ERP systems is shared with all off-the-shelf systems, namely, that the business often has to change its processes or way of working in order to fit the way the software works. This may not present a problem if a company is looking to re-engineer its processes since, then, the ERP software can provide a framework.

Owing to the high cost of ERP solutions, only large companies can afford the cost of the software and the consultants that will often cost millions of pounds. Smaller companies can take advantage of the features of integrated accounting packages that now provide modules beyond those of the basic accounting package.

In summary, for large companies, the advantages of ERP systems would appear to outweigh the disadvantages, but they are too costly for smaller companies.

Examination questions

1. **Information systems play a critical part in supporting a company's activities. Using specific examples, you are required to:**

(a) **define an information system;**

(b) **describe the categories of computer-based information systems, providing relevant business examples for each category identified;**

(c) explain how computer-based information systems can support managers at each level of an organisation.

(a) The definition given in the text (p. 42) is as follows:

A business information system is a group of interrelated components that work collectively to carry out input, processing, output, storage and control actions in order to convert data into information products that can be used to support forecasting, planning, control, coordination, decision-making and operational activities in an organisation.

Students need not duplicate this definition, provided an acceptable alternative is offered. In addition, extra credit might be given if the student discusses aspects of the definition.

(b) Here, students are expected to recall the two broad categories of information systems (operations information systems and management information systems) before describing the more specific sub-categories. The categories are given in the text and the appropriate table is reproduced here:

Typical operations and management information systems

Operations information systems	Management information systems
Transaction processing systems	Decision support systems
Process control systems	Information reporting systems
Office automation systems	Executive information systems

The table below offers a brief description of each category and provides a suitable example. Note that this material is derived directly from the text.

Descriptions and examples of the different categories of BIS

Category	Description	Example
Transaction processing systems	Involves recording and processing the data that result from an organisation's business transactions.	The production of bills for utilities and other services.
Process control systems	Used to support and control manufacturing processes.	The use of sensors for real-time monitoring of production processes.
Office automation systems	The application of information technology to many of the common tasks carried out in a typical office.	Using a word processor to produce business correspondence.
Decision support systems	Provide managers with information needed to support semi-structured or unstructured decisions.	The use of spreadsheet software to carry out *what if?* questioning.
Information reporting systems	Produce reports containing the information required to support a manager's day-to-day decision-making activities.	Production of on demand reports, such as current stock levels for a particular item.

Executive information systems	Used by senior management to select, retrieve and manage information that can be used to support the achievement of an organisation's business objectives.	Personal information managers (PIMS) can be used to schedule meetings, make notes, store information on contacts and organise other items of information, such as personal expenses.

(c) Students should describe the kinds of information systems used at each level of the organisation. Extra credit should be awarded if Figure 2.7 (p. 45) is reproduced.

This is a fairly broad area to cover within the confines of an examination, but a good response would make the following points:

At the bottom level of the organisation, information systems are often concerned with the automation of routine tasks. Transaction processing systems are commonly used to increase the speed and efficiency of tasks such as processing payments and invoices. In manufacturing organisations, process control systems help to increase efficiency by automating much of the production process and by helping to maintain quality and consistency of output. The information systems used support managers by helping them organise, manage and process large volumes of data. As an example, a manager overseeing a production process might examine quality control information in order to ensure the smooth running of the process. In some cases, many millions of precise measurements might be reduced to several relatively simple charts so that the manager can observe trends and make decisions accordingly.

Managers at the middle level of the organisation carry out many of the tasks performed by operational and strategic managers. For this reason, they will use many of the information systems found throughout the organisation.

At the topmost level of the organisation, information systems are commonly used to help determine the organisation's overall strategy. Here, information systems support decision-making activities by gathering together a body of information often drawn from a wide variety of sources. This information is then summarised and presented in a form appropriate to the task being undertaken. As an example, consider formulating a long-term pricing policy. Information might be drawn from a number of sources: production costs, competitor pricing, predicted demand for product (via market research), predicted costs of raw materials and so on. A number of different information systems might be used to gather all the information needed. For example, a database might be used to retrieve information held by the organisation itself, such as production costs, while Internet software might be used to retrieve information held externally, such as competitor prices. Once gathered together, the information might be entered into a spreadsheet package so that a model or simulation could be constructed.

At the strategic level, information systems are also commonly used to improve personal efficiency. The personal information manager (PIM), for example, can be used to help managers schedule meetings, manage personal expenses and produce prioritised lists of tasks.

2. **Computer-based information systems are critical to an organisation's survival in the modern competitive environment. Discuss this statement with reference to the following:**

(a) **Porter's competitive forces model and the basic competitive strategies that can be used to gain advantage;**

(b) **how computer-based information systems can support these strategies;**

(c) how an organisation's information resources can be used to create information leadership.

(a) Students should list Porter's five forces and describe each in turn. The 'five forces' are as follows:

- the threat of new entrants;

- the bargaining power of suppliers;

- the bargaining power of customers;

- the threat of substitute products or services;

- rivalry among existing competitors.

Having provided a description of these forces, the student should then describe the major competitive strategies that can be used to gain competitive advantage. Where possible, this material should refer back to Porter's model. Some of the points that might appear include the following:

- As new companies enter a particular market, an organisation's share of that market is likely to be reduced. In order to prevent this, organisations attempt to create *entry barriers* that limit the number of new entrants to the market.

- By attempting to reduce costs as far as possible, an organisation can attempt to gain *cost leadership*. This provides two major benefits. First, the organisation can choose to lower prices in an attempt to force competitors from the market. Second, more of the organisation's resources are freed up, allowing it to pursue other strategies, such as investing in research and development as a means of stimulating *business innovation*.

- The organisation may focus on a particular segment of the available market by differentiating its products from those of its competitors. For example, a car manufacturer may emphasise the quality of its vehicles so that it can focus on the luxury car segment of the market. Many organisations use *product differentiation* as a means of consolidating their positions in the market.

(b) Students should describe common methods of using information systems to gain competitive advantage. Such methods include the following:

- improving operational efficiency

- raising barriers to entry

- locking in customers and suppliers

- promoting business innovation

- increasing switching costs

- leverage.

(c) A good answer might include the following points:

- A common way of *locking in customers and suppliers* is by establishing standards for computer-based information systems. The example of SABRE (American Airlines) might be referred to here. This approach also has the benefit of increasing *switching costs*.

- High levels of automation tend to raise *entry barriers,* since new entrants to a given market must invest heavily in computer-based information systems if they wish to compete effectively.

- High levels of automation also provide the possibility of gaining *information leadership*, since the organisation is in a good position to exploit fully the data it already owns. Data mining might be given as an example in support of this point. In addition, the ability to exploit the organisation's information resources can help to promote *business innovation*.

- As organisations automate more and more of their routine tasks, they may be able to adopt a strategy based on *cost reduction*. The sharp growth in telephone banking services provides a good example of this. Many such organisations have been able to automate a large proportion of the services offered to customers with the result that only a relatively small number of staff based in a call centre are required to handle an organisation's workload. In turn, this has allowed these organisations to reduce the number of branches they operate, leading to further reductions in costs. In addition, students might make the point that *transaction costs* are lowered significantly by allowing customers to handle the majority of business transactions by themselves.

3. **Large retail organisations employ a wide variety of computer-based information systems in order to support their activities. Considering a large supermarket chain, such as Sainsbury's, you are required to:**

(a) **define the term 'computer-based information system'.**

(b) **identify the types of computer-based information systems that are likely to be found within a typical branch. Your response should describe the function of each system identified and the category to which it belongs.**

(c) **selecting one of the systems identified in (a), describe the system in more detail, identifying the hardware, software, data and people resources it employs.**

(a) This task might be attempted in two ways. First, students might offer a general definition of an information system and suggest that a computer-based information system is a form of information system that makes extensive use of ICT (information and communications technology). The preferred definition for an information system (as given on p. 42) is:

A business information system is a group of interrelated components that work collectively to carry out input, processing, output, storage and control actions in order to convert data into information products that can be used to support forecasting, planning, control, coordination, decision-making and operational activities in an organisation.

Alternatively, students can suggest that computer-based information systems make use of people resources, hardware resources, software resources and data resources in order to create information products. Each resource should be described briefly and students should provide examples where relevant.

(b) The material dealing with Question 3 of the Discussion questions section for Chapter 2 contains information concerning the computer-based information systems that might be found in a typical supermarket. Students should attempt to place each system identified within one of the categories described in the text. A summary of these categories is given in Question 1(b) of this section.

(c) Students should provide a relatively structured response to this task. The example in the table below uses a typical stock control system that one might expect to find in a supermarket branch.

Resources needed for a stock control system

Resources	Examples
People resources	• Stock control staff • IT staff • Sales assistants (using electronic tills)
Hardware resources	• Bar code readers (for checking stock on shelves) • Electronic tills • Terminals (for checking stock levels etc.) • Printers (for reports etc.)
Software resources	• Stock control software • Database (holding supplier details etc.) • Company documents (e.g. policy on setting reorder levels)
Data resources	• Supplier details • Pricing information • Stock levels • Sales data

4. Draw a diagram illustrating the main components of a generic system.

Students should reproduce Figure 2.2 from the text (p. 37). Additional credit should be given if the student discusses each of the components drawn.

5. Explain why feedback and control are important in business information systems.

The response should recognise two important points:

• Feedback is used to monitor the overall performance of the system.

• Control is used to adjust the performance of the system.

Both elements are required in order for the system to adjust its performance/behaviour so that it can continue to meet its purpose (objective). It is rare to find a system that does not provide feedback and control mechanisms since this assumes that the system will always function at optimum performance.

6. Define an enterprise resource planning application. Name two main disadvantages of this type of approach.

Enterprise resource planning software provides integrated applications for major business functions such as production, distribution, sales, finance and human resources management. It is normally purchased as an off-the-shelf package that is tailored by a consultant. A single package typically replaces many different previous packages.

The main disadvantage of the use of ERP systems seems to be the high costs charged by suppliers due to the demand for this type of system. This high demand has also given rise to skills shortages. The other disadvantage of ERP systems is shared with all off-the-shelf

systems, namely, that the business often has to change its processes or way of working in order to fit the way the software works. This may not present a problem if a company is looking to re-engineer its processes since, then, the ERP software can provide a framework.