

3 Information systems

Organisations can exploit information to do better at planning, monitoring and controlling their business activity. However, it is easy to drown in a sea of data. People can best understand and use information when it is organised and presented in the ways that are most useful to them. Powerful PCs, servers and networks provide new tools and systems to process information. This improves how people can run their businesses and plan their activities.

Information systems consist of software, hardware and communication networks. They collect, organise and distribute information. Good decision making comes when this information is reliable and is presented usefully. Information systems can also provide a competitive advantage and promote efficiency. To understand how these information systems work you will also need to know how companies are organised into functional areas such as sales or purchasing.

As an ICT professional, you need to know how to judge if information is reliable and accurate as well as the legal responsibilities an organisation has under the Data Protection Act and other laws.

Learning outcomes

After completing this unit you should:

1. understand how organisations use business information
2. understand the issues related to use of information
3. know the features and functions of information systems
4. be able to use IT tools to produce management information.

Assessment and grading criteria

This table shows you what you must do in order to achieve a pass, merit or distinction grade, and where you can find activities in this book to help you.

To achieve a pass grade the evidence must show that you are able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, you are able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, you are able to:
<p>P1 explain how organisations use information See Assessment activity 3.1, page 14</p>	<p>M1 illustrate the information flow between different functional areas See Assessment activity 3.1, page 14</p>	<p>D1 explain how an organisation could improve the quality of its business information See Assessment activity 3.1, page 14</p>
<p>P2 discuss the characteristics of good information See Assessment activity 3.1, page 14</p>		
<p>P3 explain the issues related to the use of information See Assessment activity 3.2, page 20</p>	<p>M2 assess how issues related to the use of information affect an organisation See Assessment activity 3.2, page 20</p>	
<p>P4 describe the features and functions of information systems See Assessment activity 3.1, page 14</p>		
<p>P5 identify the information systems used in a specified organisation See Assessment activity 3.1, page 14</p>		
<p>P6 select information to support a business decision-making process See Assessment activity 3.3, page 29</p>		<p>D2 justify the information selected to support a business decision-making process See Assessment activity 3.3, page 29</p>
<p>P7 use IT tools to produce management information See Assessment activity 3.3, page 29</p>	<p>M3 generate valid, accurate and useful information See Assessment activity 3.3, page 29</p>	

How you will be assessed

This unit will be assessed by a number of internal assignments that will be designed and marked by the staff at your centre. It may be subject to sampling by your centre's External Verifier as part of Edexcel's ongoing quality assurance procedures. The assignments will be designed to allow you to show your understanding of the unit outcomes. These relate to what you should be able to do after completing this unit.

Your teacher will tell you precisely what form your assessment will take, but it could be in the form of:

- presentations
- case studies
- practical tasks
- written assignments.



Jade, BTEC National IT student

This unit gives you a good insight into how IT works with a business. For example, when most of us go into a shop we just buy something and think nothing of it. This unit makes you think about the effect your buying has. It goes through the systems that are used.

The first assignment showed me the difference between information and data, which I just thought were two different words. I found the assessment easy, but the higher grades were harder, especially the distinctions, as they needed a lot more depth and understanding.

I found that in my part-time job at Sainsbury's it's made a difference to my understanding. I use a scanner to check stock levels on the shelves and I didn't use to think about it. Now I know why I scan the gaps and what low product quantities do to the systems, tracking the storeroom and re-ordering stock.

This unit shows you how to process data and make it presentable to others so it can be read easily. You also learn how to break down an organisation into smaller sections and see what information goes where by using data flow diagrams. This can improve how businesses are run and how they plan their activities.

Information systems consist of software, hardware and communication networks. They collect, organise and distribute information. They can also increase profits and promote efficiency. Right now, this hasn't made any difference to me outside of work, but I know it will help in job interviews as it will be a lot easier to talk about how company IT systems work.

At the start of the course, I thought it didn't have much practical work in it so would be boring, but now I understand why the theory is important.

Over to you

- **What part does the scanner take in Sainsbury's information systems?**
- **Find examples of information that is clearly presented and information that is poorly presented.**
- **What information do you think might be communicated between sites by information systems?**

1. Understand how organisations use business information



Warm-up

Ethical information

Companies hold a lot of information for different purposes, which can be accessed by members of staff as part of their job, but which might also be useful information that could be used in other ways.

What do you think are the rights and wrongs of these situations?

- A bank employee finds out how much money is in the bank account of someone owing money to their partner's business, claiming to be broke.
- An employee finds out that their company has received a lot of complaints regarding pollution of a local river and sends this information to the local newspaper.
- An employee has a friend who is tendering for work from their employer and tells the friend how much has been quoted in the other tenders that have been received for this work.

Are there any situations where you think whistle blowing on an organisation is the right thing to do?

1.1 Types of information

Two main types of data are considered here:

qualitative and **quantitative**.

Key terms

Qualitative – personal and subjective.

Quantitative – factual, often number-based, obtained through well-defined processes.

Case study: Fast food customer satisfaction survey



Diana works for a company that runs customer satisfaction surveys for a fast food chain. She visits their stores and carries out surveys with customers. She records their responses, which are used by the store and company management to make improvements.

Here are some of the questions that Diana asks customers. For each question, decide whether the information obtained will be qualitative or quantitative. The first two have been done for you to get you started. Add some more questions of your own and do the same for these questions.

- 1 How long did you wait to place your order? – quantitative
- 2 Was your server friendly? – qualitative
- 3 Was your server well-groomed?
- 4 How long did you wait for your order to be delivered?

- 5 How clean was the store?
- 6 Was your server wearing a name badge?
- 7 How tasty was your food?



Primary data

Primary data is data that you collect yourself. You may do this by direct observation, surveys, interviews or logs. You should be able to rely on primary data because you know where it came from. You also know what you have done to the data to process it.

Secondary data

Secondary data is data that you collect from external sources such as:

- the Internet
- television
- written articles in journals, magazines and newspapers
- stories told to you verbally.

You should rely less on secondary data because you cannot be certain how accurate it is. It may also include bias because of a point its author is trying to make.

Primary data is often expensive and difficult to get hold of. However, you can trust it. Secondary data is usually cheaper and easier to collect, but you may not be certain of its accuracy or scope.

1.2 Purposes of information

Organisations use business information in many ways to help them become more effective. Four of the most important ways are operational support, analysis, decision making and gaining advantage. This section explains each of these terms and gives examples of how a business might use them.

Operational support

When monitoring and controlling its activities a business can make immediate use of the information from its operational support system to make its minute-by-minute or hour-by-hour decisions. For a restaurant, for example, some of their products are freshly prepared, while others are cooked in batches or need time to defrost. If customer orders are recorded on an **EPOS** system, then an operational support system can alert the restaurant management as to when they need to cook or defrost more bulk products.

Key term

EPOS – stands for electronic point of sale. It is an automated till system used in many shops and restaurants.

Analysis

Analysis is where the business regularly does the same or similar processing of its data. This is typically to identify patterns or trends and to monitor the business. A business might produce a weekly sales and costs report. This would show a trend of whether profits are increasing or decreasing and whether increased sales drive up costs.

For example, a restaurant chain might use analysis to compare the performance of similar restaurants, to compare one restaurant against the regional or national average or to identify the impact of a promotion on sales and costs. Analysis may also be used to identify patterns such as the increase in sales at Christmas or Easter.

Analysis can be a powerful tool to predict sales and demand in the future, which in turn helps the organisation to know how much stock to buy in, what staffing is required and what advertising needs there are.

Decision making

Information systems can support decision making when a problem or issue arises and management needs to take action to resolve it. This is typically done on an ad hoc basis as problems arise. Management can take these decisions at various levels: operational, tactical or strategic.

For example, the management of the restaurant chain might want to reduce costs. They might decide to do this by a reduction in the hours that some of their restaurants are open. They could decide when to close the restaurants by looking at information on sales and costs by hour of the day, by day of the week and by branch. They could open later or close earlier if sales less direct costs were low. This could be operational (for one branch), tactical (for a group of branches) or strategic (for a region or nationally).

Gaining advantage

This is the opposite to resolving a problem in that it is about taking advantage of external or internal events. It is done on an ad hoc basis as and when opportunities arise. It is also used to identify patterns or trends, this time with the aim of making decisions to benefit from these events.

For example, how should the restaurant respond when the local football team gains promotion to the premier league? Should management employ more staff or open longer on match days? Should they advertise more at the club ground? Or should they do special promotions?

Another example is if a competing chain goes out of business. What actions should the restaurants near to their former competitor take? What might be the effect of taking these actions?

1.3 Sources of information

Internal information

Within a business, each department produces information which is of value to other departments.

Often, putting this information together right across the business gives valuable insights to the senior management of the company. Table 3.1 gives some examples of the information that different departments in an organisation might produce.

External information

There is also a lot of information available externally to organisations that can help them in their decision making. Table 3.2 gives some examples.

Organisational department	Type of information produced
Administration	In some organisations, some or all of the data production tasks mentioned below are done and/or stored by a central administration department
Finance	Information about revenues or income, costs or expenditure, assets or capital items, liabilities or known future costs and investments
Manufacturing	Information about what resources are used and the timescales in which input products are turned into output products
Marketing	Information on the organisation's customers, either individually or grouped by category of customer; may also be responsible for the definition and description of the products and how these are grouped as brands
Personnel / HR	Information about the people that the organisation employs, such as their contact details, jobs, grades and skills
Purchasing	Information based on purchase orders about who supplies which products to the organisation, how often and for what price

Table 3.1 Internal information

Source of external information	Type of information available
Commercially provided databases	Information on the organisation's customers, either individually or grouped by category of customer; may also be responsible for the definition and description of the products and how these are grouped as brands
Government	Many governments, both central and local, require organisations to provide them with a great deal of data. Once the government has processed and summarised this data, the information can often be reused. However, as it is produced primarily for government purposes, this is not always timely or detailed enough for other uses
Research	Many consultants with a deep knowledge of a particular industry know exactly where to look and who to contact to find needed information. Organisations can use this external research to find advice or information to improve their decisions
Trade groupings	Almost all trades have formed groupings of businesses in that trade to influence others for the benefit of their trade

Table 3.2 External information

Case study: Trade groupings

A good example of a trade grouping is IATA (International Air Transport Association), which is the trade grouping for the airline industry. Its aims are summarised as follows.

- IATA simplifies travel processes for passengers.
- IATA allows airlines to operate safely, securely, efficiently and economically.
- IATA serves as an intermediary between airlines and passengers.
- A large network of suppliers gathered by IATA provides solid expertise to airlines in a variety of industry solutions.
- IATA informs governments about the complexities of the aviation industry to ensure better long-term decisions.

- 1 What information might IATA supply to its member airlines?

- 2 What information might IATA supply to passengers?
 3 What information might IATA supply to governments?



Activity: Organisations and information



- 1 Consider several organisations of your choice. These could be, for example, your local council, a college, a shop, or a restaurant.
- 2 What types of information is each organisation likely to need?
- 3 Where could each organisation get the necessary information from?
- 4 In each organisation, which departments are involved in collecting and processing the different types of information?
- 5 What are the similarities and differences in information needs between the organisations you have selected?

The old adage 'you get what you pay for' can apply here, with free data being particularly suspect, although the government does publish a lot of trustworthy data.

There are many commercial database that an organisation may choose to purchase from their providers, especially if the data has direct relevance, such as detailed information about potential clients in a geographical area.

Reliability is often related to quantity, so a large, targeted dataset from a trustworthy source can be valuable to an organisation.

1.4 Good information

Information is of the most use if it has the following characteristics.

- **Valid:** It should be unbiased, representative and verifiable.
- **Reliable:** How well does it fit in with other facts you already know? How well do you trust this source of data?
- **Timely:** Information should be available when it is needed for decision making and not some time afterwards.
- **Fit for purpose:** Was this information provided for the purpose for which it is now being used? For

Reliability of data sources

There are many sources of data, both good and bad, so it is important to understand how reliable your data sources are. Obviously, data from a reliable source can be trusted and so important decisions can be based upon it.

Usually, the most reliable data is that which you or your organisation has created. But often the need is for external data that can be used to help plan operations or assist in other decision making.

example, a monthly budget prepared six months before the start of the year may not be of much use in forecasting the remaining spend for the last two months of the year.

- **Accessible:** You must be able to do calculations with the data. For example, a printed report may be valuable, but if it contains a lot of data you would not want to have to key it all in again in order to perform calculations.
- **Cost-effective:** The cost of capturing and producing the data should be very much less than the value of the decisions made on that data. It is said that the cost to business of government laws to capture data is often greater than the benefit gained from these laws.
- **Sufficiently accurate:** Information needs to be accurate enough but not necessarily completely exact. If you are calculating whether you can afford to buy a car, you will need to know how much capital you have available and how much you can spend per month. You will also need to know the expected monthly total running costs and the cost of the car. However, these costs do not need to be exact as there will be some flexibility – e.g. you could reduce your monthly mileage to reduce your monthly costs or buy a cheaper car to reduce the monthly loan repayment cost.
- **Relevant:** There is no point in capturing information if it is not relevant to the decisions you want to make from it.
- **Having the right level of detail:** You need to capture enough detail for the purpose that is required, but no more. If you manage your household accounts, it is unlikely that you will record every postage stamp purchased or every item in your shopping basket. You are more likely to record just the totals.
- **From a source in which the user has confidence:** You need to know how believable it is. For a news item, you are more likely to accept a story reported in several national newspapers rather than one on an individual's web page.
- **Understandable by the user:** It must be at the user's level. For example, share-buying advice in a weekend newspaper for the general public might have one paragraph for each share. At the other extreme, financial analysts advising pension funds with billions of pounds of assets would give much more detailed recommendations.

Case study: Retail sales information systems



Two competing retail chains developed sales information systems to help their management have the right stock in their stores at the right prices.

- One captured detailed data from the till systems of every store every night. It provided detailed sales figures for local and regional management by 07:00 the following morning. This gave them an excellent way to manage sales, though it was not completely accurate as it didn't account for returns or exchanges.
 - The second system tracked all goods from ordering from a supplier through to customer delivery and possible return. Its main purpose was to provide the company's monthly financial accounts. This was, however, less successful as a sales information system than the first system, as it was several days, and often weeks, before sales information was available in a suitable form for management to take sales decisions.
- 1 List the advantages to the retail chain of the first system.
 - 2 List the advantages to the retail chain of the second system.
 - 3 List the types of retail store that would prefer the first system and those that would prefer the second system.

1.5 Business functional areas

As well as being sources of information, parts of a business want to gain a good understanding of how they perform. They want to use this information to help them to perform better. This section gives examples of the sorts of things they might do. It builds on the information you saw in Table 3.1 (page 9).

Sales

The sales department is interested in what products they have sold, to whom and for how much. Sales analyses are of great use to the sales department. These could include data on sales organised by:

- product and product group
- store, location or outlet and various groupings by geography, store size and organisation hierarchy
- salesperson, for bonus purposes
- customer and customer type.

Each of these might be organised by time of day or day of week, or as a comparison against the previous week, month or year.

Purchasing

The purchasing department is interested mainly in how their suppliers perform. They would analyse them by price, by lead-time, by fewest problems and by product availability. The best supplier would have one of the cheapest prices, deliver quickly and reliably, not give problems with product quality or paperwork and always have the products needed available.

Manufacturing

The manufacturing department wants to show how efficient the business is. This means that they analyse how well they use their staff and machinery, how well they produce the most successful products, how they minimise wastage and how well they can react to changing demands.

Marketing

The marketing team is interested in analysing the customers and competitors. Like sales, they are interested in sales by customer and customer type. They may well have segmented the customers into types such as 'wealthy pensioners' and 'trendy teenagers'. They may also have segmented their addresses into groups such as 'rural farming' and 'affluent suburbs'.

They are interested in which products sell best to which customer type, for advertising and promotional purposes. They will also do external competitor analyses. These may focus on what competitors are doing to attract the most profitable customers.

Finance

The information from the finance department is often split. Financial accounting is concerned with what money the organisation has: its income and expenditure. Management accounting is concerned with how the money is spent. For example, the management accounts of a college would say how much money each subject department has spent: ICT, Business Studies, etc.

Personnel

The human resources or personnel department analyses information about the people that the organisation employs. They will monitor staff turnover,

average staff wages, average days off sick and hours worked in order to comply with labour laws and staff agreements.

Administration

If there is a central administration department, they may prepare reports that apply to the whole organisation. They may also prepare and use some of the departmental reports.

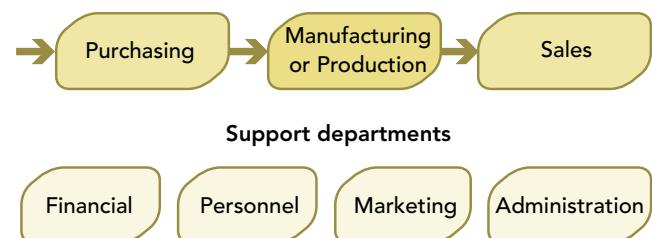


Figure 3.1: Diagram of a manufacturing company, showing each department and flow

1.6 Information flows

Information flow is the movement of information relevant to the business, from where it is produced to where it can be auctioned. For any organisation, speedy, efficient information flow is very important to its success.

Internal information flows

Within most organisations, there are three types of information flow.

- **Downwards:** Senior management informs the rest of the organisation about decisions taken and the direction of the company.
- **Upwards:** The staff of the organisation report to management on their progress and on any successes and problems that management need to address.
- **Across:** Information is passed between different parts of the organisation so that they can work together to achieve their common goals.

For example, an IT department has information flows to and from the parts of the organisation for which it develops or maintains systems. It maintains a help desk to record and resolve day-to-day problems with systems used by other departments. The management of the IT department holds a weekly meeting with departments that use ICT services in order to report on progress and identify trends.

Information flows to external bodies

Information also flows out of an organisation. Almost all organisations will provide information to their customers. This may be targeted to individual customers (such as a bank statement or utility bill), to a group of customers (such as a council's report on its performance) or to all customers (such as a public company's annual report). In the past, this information would always have been delivered in printed form, but is now increasingly likely to be delivered via the Internet.

Information also flows to suppliers and many organisations are also legally required to send large amounts of information to government bodies.

Information flow diagrams

An information flow diagram shows the steps involved in data flow – it includes where data is originally produced, where it is turned into information and where decisions are made on that data.



Figure 3.2: Information flow – aircraft punctuality management long ago

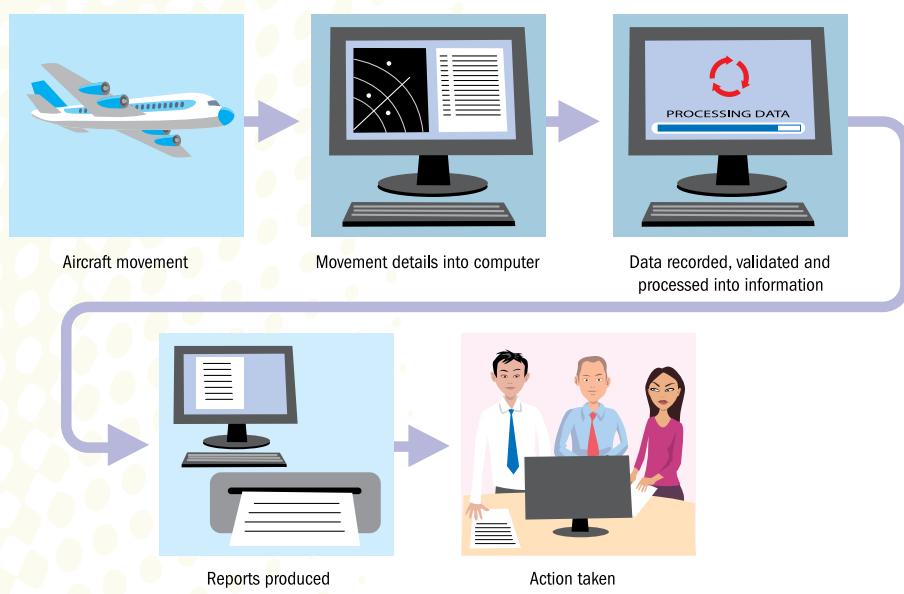


Figure 3.3: Information flow diagram – aircraft punctuality

Figure 3.3 shows the steps involved in an information system today, turning aircraft movement data into aircraft punctuality information.

1. Aircraft movement (data)
2. Time and other movement details entered into local computer
3. External body records aircraft movement data
4. Movement data validated, processed into information, sorted and stored centrally
5. Screens and reports produced analysing movements in many ways
6. Analysts take action on information

Assessment activity 3.1

P1 P2 P4 P5 M1 D1



You are working in the publicity department office of a large bank as a junior publicity and media officer. After a recent financial rescue from the government, the bank is starting a publicity campaign to explain to the public the good work it does.

You have been allocated some tasks to help prepare for a set of road show materials that are to be set up in shopping malls throughout the country.

- 1 Prepare a poster entitled 'Good information' to explain how the best information should be valid, reliable, timely, fit-for-purpose, accessible, cost-effective, accurate, relevant, have the right level of detail, from a reliable source and understandable by the user. **P2**
- 2 Prepare a brochure entitled 'How to improve the quality of business information' targeted at small businesses, explaining how to make the best of their information.

The brochure should include your task one poster as an image with writing to cover these areas, explaining how an appreciation of each of the aspects of information can improve its quality:

- Types of information
 - Purposes of information
 - Sources of information. **D1**
- 3 Prepare a poster entitled 'Using information' to show how data is transformed into information by organisations. The poster needs to identify some ways that organisations use their information. **P1**
 - 4 Prepare a slide show presentation entitled 'Information systems' which can run as a continuous loop on road-show computers. The presentation needs to have four sections:
 - Features and functions of information systems **P4**
 - Types of information systems **P5**
 - Business functional areas **M1**
 - Information flows. **M1**

Slides for the features and functions of information systems should include what data is, who uses information systems as well as the hardware, software and telecommunications used by these systems. Include slides about input, storage, processing, output, control/feedback loops, closed and open systems. **P4**

Slides for the types of information system need to be for a named organisation and should include the management information systems and other information systems such as marketing, financial and human resources the organisation actually operates. **P5**

Slides for the business functional areas should include sales, purchasing, manufacturing, marketing, finance, personnel and administration **M1**

Slides for information flows should use suitable diagrams to show both internal information flows and information flows to external bodies. **M1**

Grading tips

- The poster needs to explain how organisations use information **P1**
- This poster could give some examples of why data is important and how information can meet these needs **P2**
- Structure your presentation into sections for both the features and functions of information systems with follow-on slides to give more detail **P4**
- Make sure you name the organisation using the information systems in these slides **P5**
- You need to identify some different functional areas and how information flows between them **M1**
- Use the bullets in the task to structure your brochure explaining how an organisation could improve the quality of its business information **D1**

PLTS

Text to follow from author



Functional skills

Text to follow from author



2 Understand the issues related to use of information

2.1 Legal issues

There are many laws that affect the use of information.

Three of these are the:

- Data Protection Act 1998
- Freedom of Information Act 2000
- Computer Misuse Act 1990.

Data Protection Act 1998

The Data Protection Act 1998 provides a framework to ensure that personal information is handled properly. It also gives individuals the right to know what information is held about them.

The Act works in two ways. Anyone who processes personal information must register with the DPA registrar and comply with eight principles. These make sure that personal information is:

- fairly and lawfully processed
- processed for limited purposes
- adequate, relevant and not excessive
- accurate and up to date
- not kept for longer than is necessary
- processed in line with your rights
- secure
- not transferred to other countries without adequate protection.

The Act also provides individuals with important rights. These include the right to find out what personal information is held on computer and most paper records.

Freedom of Information Act 2000

The Freedom of Information Act 2000 deals with access to official information. It gives individuals or organisations the right to ask for information from any public authority, including central and local government, the police, the NHS and colleges and schools. They then have 20 days to provide the information requested. They may refuse if the information is exempt from the Act. Examples of exemption are if releasing the information could prejudice national security or damage commercial interests.

Other relevant legislation

The Computer Misuse Act 1990 details three offences:

- unauthorised access to any computer program or data – the most common form of this is using someone else's user ID and password
- unauthorised access with intent to commit a serious crime
- unauthorised modification of computer contents. This means impairing the operation of a computer, a program or the reliability of data. It also includes preventing access to any program or data. Examples of this are the introduction of a virus, modifying or destroying another user's files or changing financial or administrative data.

Some minor changes to tighten up this Act were introduced as a small part of the Police and Justice Act 2006. This made denial of service attacks on a server illegal.

2.2 Ethical issues

Codes of practice

Many organisations will have a code of practice to make it clear what uses can be made of their computing facilities. The main uses will be to support the purpose of the organisation, but a code of practice will often define the extent to which private use of the computer system is permitted. Examples of items included in a code of practice are as follows.

- **Use of email:** Threatening or harassing emails are usually banned, as well as spamming or producing large numbers of unsolicited emails. Limited use of email for private purposes is often allowed.
- **Use of Internet:** Inappropriate classes of website, such as pornography or gambling, are usually banned, either by the code of practice or by filtering software. Limited Internet use for personal purposes is often allowed, as this can be difficult to distinguish from professional research. Where an organisation has its own web server, there are often strict rules as to what can be posted to it. There may be exceptions for clearly identified personal pages.

- **Whistle blowing:** Codes of practice will often protect computer users who draw management's attention to other users' misuse of the system. The codes will certainly protect IT administrators who run the servers and will often be the first to detect misuse.

Activity: Codes of practice



- 1 Find examples of computer codes of practice, either from your college or by carrying out Internet research.
- 2 Produce a code of practice for a top secret military or government establishment.
- 3 Produce a code of practice for a small web design or computer consultancy company.
- 4 List the areas in which these codes are similar. List the areas in which they differ significantly. Explain the reasons for the areas where they differ.

Organisational policies

An organisation's policies may have a significant effect on how it treats information. An organisation with a strong hierarchy that operates on a need-to-know basis is likely to impose policies restricting access to information. For example, it may keep its databases, files and email servers in a secure central data centre. IT security and data centre staff may put in place tight controls on who can access or update this data.

A decentralised organisation with decentralised computing is also likely to restrict access to information, but this time for more practical reasons. Here there may be few security restrictions on access to files, databases or email. However, there may be limited or no direct connectivity between the organisation's different computers. This could prevent staff at one location accessing information held at another location, even though the company would be happy for them to do so.

Information ownership

The department that produced the data should own every field of data in every record. They should have the responsibility for making sure that it is entered into the computer system in a timely way, that it is correct and that it is consistent.

Information ownership is much more complex. Many data owners may have supplied the original data that has been processed to produce this information. The often arbitrary way of allocating ownership is that the department responsible for defining or running the program that produces the information owns it. Except for internal IT information such as computer network performance, it is not a good idea to make the IT department responsible for information ownership. They are its guardians rather than its owners.

2.3 Operational issues

Security of information

System users expect the ICT department to keep its information secure. This means that it is safe from unauthorised or unexpected access, alteration or destruction. It is management's responsibility to specify who can look at and update information. In small organisations with a simple structure, management may decide that anyone in the organisation can look at any information or that people on an authorised list may update information.

Many organisations have much more complex rules. Management may require a log of who has made updates or accessed information. It is usually the responsibility of the IT department to advise on security and to implement the chosen rules.

For more on Security, see Unit 5: Managing Networks, page 18

Backups

It is good practice to make frequent **backups** of information in case of physical or processing problems. This may be a full backup of all information or a partial backup of just the information that has changed since the last full backup. The IT department should occasionally practise a recovery or restore from the full backup of all the information. They should then apply any partial backup.

Key term

Backup – a copy of the data that is kept in case anything should happen to the original. The term 'backup' is also used as a verb.

Health and safety

Although information systems are relatively low risk, there are a few health and safety issues that must be addressed. There are regulations that apply to screens and monitors, their positioning and usage. Keyboards, mice, chairs and tables must be appropriately positioned. Computer users are entitled to eye tests. They should have breaks away from the computer. All existing office and other workplace environment laws apply to using information systems.

Organisational policies

Many organisations have policies for the use of information systems that their staff should follow. These may range from keeping information confidential within the company to the procedures to follow to correct any information that appears to be wrong.

Business continuance plans

IT is at the heart of how many organisations operate. It should therefore be an important part of any business continuance plan (BCP) to plan how operations can continue if any major part of an IT system should fail.

The IT department should have things set up so that if there is a major failure, they will be able to continue to provide a service, even though a more limited one. A good example is to provide a dual network, attaching alternate terminals to each network. Then, if there is a complete failure of one network, half the terminals will continue to work.

The organisation needs to make decisions regarding their BCP. For example, a retailer may decide to have more tills or point of sale terminals than strictly necessary in order to allow for failure. They may also decide to have two servers in the back office driving the tills, rather than one, in case of server failure. However, do not expect the BCP to cover every eventuality.

Case study: Business continuance plans

A business has its offices in an area that is liable to flooding. It therefore decides to install the servers for its information systems on the fourth floor of the building in case the ground floor or basement ever floods. One day, the staff arrive to find water cascading through all the floors of the building due to a leak. The building is closed for several weeks while the leak is fixed and the building dries out and is cleaned. The BCP planners had not known there was

Costs

Whether an organisation is a business with a focus on costs, a government organisation whose aim is to deliver the best possible service within a fixed budget or a not-for-profit charity, it is important to manage the costs of an IT project. The total benefits of an IT project should greatly exceed the total costs. There are two important areas you should consider in the costs part of a business case.

- **Additional resources required:** The introduction of a new system often entails the one-off costs of new equipment purchase and installation, and user testing and training. In the IT department there are often more resources needed and so there will be ongoing costs to run a new system.
- **Cost of development:** This is usually a large part of the budget for a new computer system. There will also be ongoing costs once the system is running for minor changes to keep the system in line with the organisation's needs.

Impact of increasing sophistication of systems

Early information systems often just automated existing manual processes. This meant that little user training was needed and the software was relatively simple. Today's computing power means that systems are now becoming increasingly sophisticated. They need the following.

- **More trained personnel:** Users often need training in how to use the equipment, the basic computing features, the processes brought in with a new computer system and the transactions, queries and reports that form the new system.



a large air-conditioning water reservoir on the roof of the building and this had burst.

- 1 What actions might be in the BCP for that building and system?
- 2 What could have been done to prevent this incident?
- 3 Once the leak had happened, how could its effects have been minimised?

- **More complex software:** Modern development software hides a lot of complexity from the application builder. This means they can focus on the business problems that the new system will solve, and create overall better and more complex systems. However, when there are problems, it may need both a development software expert and a business software expert to work together to fix them.

Activity: Customer information and constraints



Focus on an organisation that uses customer information. This could be the organisation you studied for the activity on page 10, or another organisation. You should consider at least legal, ethical and operational constraints.

- 1 What constraints affect the way the organisation uses customer information?
- 2 How does the organisation deal with these constraints?

Assessment activity 3.2

P3 M2

BTEC

You are working in the publicity department office of a large bank as a junior publicity and media officer. After a recent financial rescue from the government, the bank started a publicity campaign to explain to the public the good work it does.

You were set some tasks preparing for a road show that was set up in shopping malls throughout the country. Visitor feedback from the show has identified some extra material that is wanted to add to the bank's website.

This extra material is to show how the bank is aware of and deals with issues around the collection and processing of information.

- 1 You are to produce some pages that could be used on the bank website to explain:
 - legal issues **P3**
 - ethical issues **P3**
 - operational issues **M2**.
- 2 The legal issues web page needs to summarise these relevant data protection legislations:
 - Data Protection Act 1998

- Freedom of Information Act 2000
- Computer Misuse Act 1990. **P3**
- 3 The ethical issues web page needs to summarise the bank's codes of practice regarding staff use of email, Internet and whistle blowing. **P3**
- 4 The operational issues web page needs to explain how the bank keeps information secure. This should include backups, organisational policies, the bank's continuance plans and the impact of increasing sophistication of systems on large organisations such as banks. **M2**

Grading tips

- Include brief summaries of how legislation affects the use of information **P3**
- Include what an organisation must do to respond to any issues related to the use of information **M2**

PLTS

Text to follow from author



Functional skills

Text to follow from author



3 Know the features and functions of information systems

3.1 Features of information systems

An information system has five parts: data, people, hardware, software and telecommunications.

Data

The data input to the system must be as accurate as it can be, subject to its cost and timescales for capture. It should then be stored in the most logical way. This often differs from how the data is input. The data then needs to be summarised to create information in a way that best meets the needs of the system's users – this may not necessarily be the most logical way or the easiest or cheapest for the IT team.

People

People are involved both in capturing the data and in exploiting the information. It is important to motivate those who capture the data by highlighting the value that the exploited data brings to the organisation.

Hardware

In a small organisation, the **MIS** may run on just the sales or finance director's PC. In larger businesses, it usually runs on a server, either shared or dedicated, with Internet or intranet access for those who need it. It is unusual to require specialised hardware.

Key term

MIS – stands for management information system.

Software

The simplest MIS can be built using standard software. However, most MIS use specialised software, which has the most common features of an MIS already built in. The developer configures this by describing the database and its structure, where the data comes from, how to summarise the data and what standard queries will be required. The cost of this software varies widely. The cheapest offers limited functions for one PC.

The most expensive is highly functional, providing high performance and many features for hundreds or thousands of users and vast amounts of data.

Telecommunications

An MIS may be delivered across the Internet, though this sometimes brings difficult security questions. Many MIS are delivered across an intranet within a company's firewall for protection from competitors and others seeking this valuable management information. Occasionally, a dedicated telecommunications network is used to provide the utmost security.

3.2 Functions of information systems

An information system has four functions: input, storage, processing, output. There is often also a control or feedback loop so that system output can affect future input, as shown in Figure 3.4.

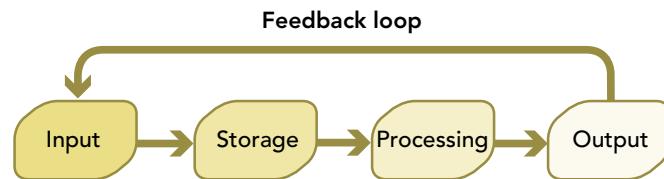


Figure 3.4: Information systems functions

Input

Input to an information system has two parts:

- There is the detailed data which is stored and processed and forms the basis for the output from the system.
- Then the user must also tell the system what sort of analyses they want from the system. Sometimes this is hidden from the user and the IT department sets this up in advance of users using the system.

Storage

The data should be stored at the most detailed level possible. The IT department may also choose to store various summaries of data for ease of use and

consistency. The IT department should take regular backups of the data. Some of these should be kept in a different location in case of a disaster.

Processing

Processing is what turns data into information. At its simplest, it may just be adding up all of the individual items sold by a supermarket and producing totals by store, by product, by time of day or by any other classification. At its most complex, a computer program or the user will perform complex calculations, make assumptions about missing data and select criteria to include or exclude. For example, a complex mathematical model might be used as part of a stock control system – as well as looking at sales, this might consider lead times, cost of being out of stock, the effect of the weather and expected future demands.

Output

Output can be in two formats: graphical and textual. **Graphical output** is often the best for seeing the big picture, understanding trends and presenting the information to management. **Textual output** is best where it is important to analyse the detail and to know exact values. A common way of using both formats is to use graphical output to identify areas of interest, then to use graphical again to focus in on the details and to switch to textual output to see the lowest level of detail.

Key terms

Graphical output – information that is presented as charts, diagrams, graphs or pictures.

Textual output – information that is presented as characters, numbers or text.

Closed system – an information system where the outputs are fixed.

Open system – information system where the user has a wide choice in how to present the output.

Output is best presented in the form that each user wants. For example, for supermarket sales, a product manager mainly wants to see sales by product or product group. The store managers are mainly interested in what is happening in their own store. A regional manager wants to see what is happening across all stores in their region. The default output for each of these users should be the one that they are interested in.

Control and feedback loops

A control or feedback loop is what happens in the organisation as a result of the output from an information system. It should have some effect, direct or not, on future inputs to the information system.

An automated example is a data feed of actual sales data to a computerised stock control system. This could note which products have increasing sales and reorder these products from suppliers in order to reduce the likelihood of being out of stock. A similar example is management looking at the sales reports to see which products are selling well and which are not. To maximise profit, they might choose to increase the price of the products that are selling well and reduce the price or offer a promotion on those that are not selling well.

Closed and open systems

In a **closed system**, the user may have some choice about what to report on, but they are limited to predefined output formats. These are often easy to use. They mainly use graphical formats and are often aimed at management.

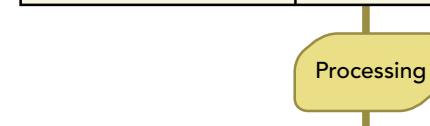
In an **open system**, there is often great flexibility on what to report on and the format in which the information is output. This powerlessness may mean that significant training is needed before the systems can be effectively used. Open systems are aimed more at analysts. They typically use both graphical and textual formats.

3.3 Transformation of data into information

You will have already heard the terms 'data' and 'information' and may have thought them different words for the same thing, as they have similar meanings. There is, however, a big difference between them as information is obtained from data.

Census Data

Census Year	Name	Age
2001	Jane	17



Census Information

Name	Date of Birth
Jane	1983 or 1984

Figure 3.5: Diagram showing data in and data out

An example of data could be a massive list of items sold by a supermarket during five years. Information obtained from this raw data might be which items have changed sales patterns over this period.

When data is transformed into information, there are usually these stages.

- **Collection:** Data is taken from where it is generated or available and is checked or validated to make sure that it is as accurate, consistent and complete as it needs to be.
- **Storage:** The data is kept for the longer term. It is often on disk, either on a personal computer or on a server. It may be on a magnetic card, a flash drive, a CD-ROM, a DVD, magnetic tape or other electronic device. Prior to the widespread use of computers, paper was the most common form of data storage and paper is still in use for small manual systems.
- **Processing and manipulation:** At this stage the input data is turned into information ready for output. At its simplest, this may just involve producing totals or averages. At its most complex, more than 90 per cent of the complexity of a system may be in this stage.
- **Retrieval:** The required information from the processing and manipulation stage, with support from the input, is brought back into the computer from storage.
- **Presentation:** The information is output or presented in the way that the user wants to see it. It can have graphics or text or both. It will most likely be presented on a screen or monitor, or sent to a printer or to another output device.

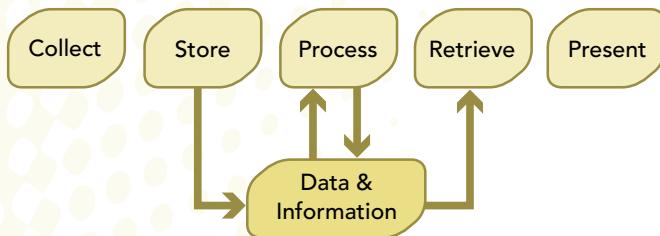


Figure 3.6: Turning data into information

3.4 Types of information system

Almost all departments of an organisation can make effective use of an information system. Here are some of the more common examples where many businesses have benefited.

Marketing systems

Many of the first examples of information systems were in marketing and sales.

- **Sales performance:** If a business could identify where and why its sales were increasing, then it could apply those conditions elsewhere with the same effect. For example, a retail chain might run an advertising campaign or a reduced price offer in one shop or a small number of shops. An information system could identify how successful this was. A chain of shops or hotels could have a programme of refurbishing their properties. An information system could show how successful this programme was in increasing business.
- **Competitors:** Typical competitive activities include selling competing products, opening competing stores and reducing prices. As competitors introduce these changes, an information system can show what effect these changes have. A business can also make similar changes specifically to compete and the system could identify the effect of these changes.

Financial systems

Once a business has an information system to help manage income or revenue, the next area to address is often expenditure or costs.

- **Financial costs:** Spreadsheets can be used to help manage regular costs. However, information systems will more easily find trends and unusual patterns. Typical questions they could answer are: Do costs regularly surge or drop at the start or end of the year? Which over-spends are gradual? Which are caused by one large unexpected or excessive item?
- **Investment returns:** A bank or investment company wants to understand its portfolio of investments. Some investments are high risk but potentially high return. Some are low risk but with low return. Some offer no return at all, but increase the capital value of the investment. An information system will help identify the investments that fall into each category.

Human resources (HR) systems

Human resources departments often produce a lot of analyses and so may have an information system to help them.

- **Staffing:** One of the goals of an organisation may be to have the right number of people doing the right work with the right skills. An information system can identify staff and skill shortages and excesses. It can also identify staff turnover, age, gender and experience profiles.
- **Professional development:** This is an extension from staffing – it covers the organisation's needs, staff training, and skills and experience for professional development. Analysis of this can identify suitable candidates for jobs and potential training opportunities for staff.

3.5 Management information systems (MIS)

Features

An MIS is a decision support system in which the form of input query and response is predetermined. It is often summarised from an information system. It is used where management want to ask the same question frequently, though perhaps about different subjects. Here are two typical questions:

- List the top ten stores for sales this month, by product type, together with last month's data and the percentage change. (This would help management review their flagship stores.)
- For a particular store, list this month's average sales by day of week and by product type. (This would help store management plan the staff needed at different times. It could also help them understand their sales – for example, it might show that groceries sell best on Fridays; wines, beers and spirits on Saturdays; and home improvement items on Sundays.)

Benefits

A benefit of an MIS is that it is easy to use by senior management, as much of the complexity is hidden from them. The answers are often provided as both tables and graphics and for import into a spreadsheet for flexibility. An MIS also typically provides answers very quickly.

Effectiveness criteria

For an MIS to be effective it must meet these criteria.

- **Accuracy:** It must be as accurate as any other source of this information.
- **Sustainability:** The information must be reliably available, week by week and month by month.
- **Consistent timelines:** Where information is displayed by time period, then these times must be consistent. For example, for a store that is open 24 hours a day, it needs to be decided when the day's sales start (e.g. at midnight or at 04:00 when the till system is backed up and reset). For a UK-based international operation, is the time based on UK local time or is it based on the local time in each country?
- **Confidence:** The users must have confidence in the MIS for it to be used. This means that any faults found with the data, processes or computer system must be quickly put right. The users need to be informed of the upgrade and reassured that it has improved the quality of the system.

Case study: Where in the world are we?

An international organisation reduced its sales management overheads by merging its African sales division into the UK division. ICT had to change their MIS to attribute all African sales to the UK. The operations department then decided that part of their New York operation should be allocated to the European division. This was more complex as all New York sales and some operations remained with the New York division.

Geographic changes often happen with information systems. One of the best ways to cope with this is to have supporting data that relates divisions with their names and what forms them. It is then easier to add or take away the parts that change and to rename the divisions.

- 1 What are the advantages of summarising data, for example by division, before making it available to the users?
- 2 What are the advantages of every query going to the detailed data to produce the information?
- 3 What could the IT department do to reduce the effect of such changes?

4 Be able to use IT tools to produce management information

IT tools offer organisations powerful assistance in understanding the marketplace and how well the organisation is performing.

4.1 Tools

Databases

At the heart of every information system is a database. One of the first tasks in developing an information system is to design the data model. A data model (see Figure 3.7a) describes every piece of information stored in the system, what it means and how it relates to the rest of the data. It is a business document and could apply just as well to a manual system based on paper stores.

A database (see Figure 3.7b) is where all the data described by the data model is actually stored, usually on disk. It has indexes to speed access to frequently used data and pointers from one piece of data to another.

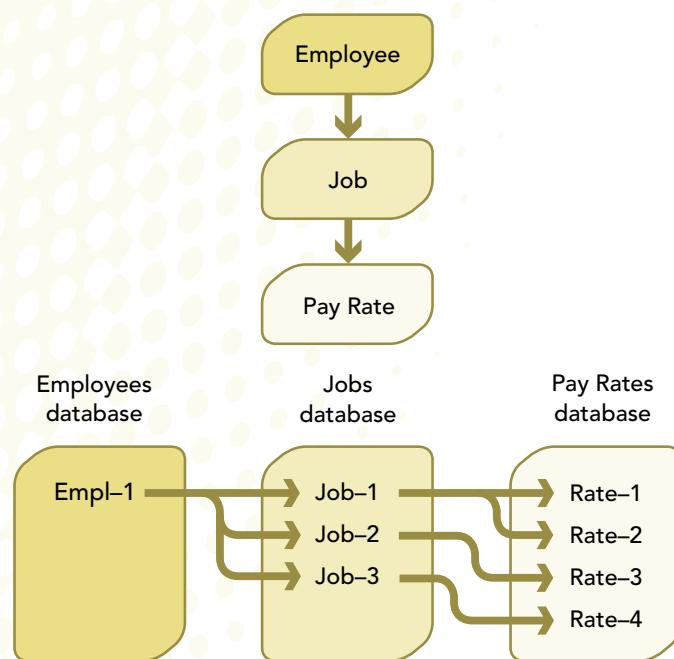


Figure 3.7: a) data model b) Database showing linked tables or files

Artificial intelligence (AI) and expert systems

AI and expert systems have rules, which may be changed, to model business actions taken by an expert. A good example of this is an airline fare management system. The business objective is to sell all the seats on a flight for the most money. High demand increases the price of a ticket or fare, while low demand reduces it. This expert system increases the fare each time a ticket is sold. If no seats are sold, it reduces the price as the date of the flight approaches. Rules will say how quickly the price changes and if there is a maximum or minimum fare for the flight.

Activity: MIS and tools



Again select an organisation that you know.

- 1 Describe the features and key elements of a management information system (MIS).
- 2 Show how and where it supports the functional areas of your chosen organisation.
- 3 For your chosen organisation compare, with examples, how useful different tools might be for processing information to support effective business decision making.
- 4 Evaluate a range of these tools noted in question 3 with respect to their support in decision making.
- 5 Explain the purpose and operation of data mining and predictive modelling.

Predictive modelling

Predictive modelling is an expectation of many information systems as it gives the organisation help in understanding what the future may hold. The information system uses old historical data to create a model, allowing the organisation to see what is likely to happen in the future. Within predictive modelling there may be parameters that can be adjusted to allow for different situations, such as worse than expected sales, the effects of taking on extra staff, etc.

Internet

Most systems today provide Internet access to them. Some may be for general public or subscriber use. Many are restricted to members of the organisation and will be protected, often by a user ID and password. Providing access from the Internet reduces many of the network issues that an organisation may face. Internet access can also reduce development time, as part of the system can be built using one of many easy-to-use Internet development tools.

Data mining systems

An example of another tool is a data mining system. When directed by an expert user, this finds patterns in sets of data. Sometimes these patterns are known, but it is of greatest value when they are not. Sometimes they are used to identify groups of customers.

For example, a supermarket may know its total sales and total customers per day. However, this simple statistic hides the fact that a large number of its customers come in to buy just a newspaper and maybe a few low-value items. This means that the average sale per customer will be much less than the value of a weekly shopping trolley.

Activity: Tools



By searching the Internet, or using information provided by your tutor, research information system tools that are available.

- 1 List the types of tool that you find.
- 2 What does each tool do? Give an example of where it might be used.

4.2 Gather information

An information system without information is not very useful, so data has to be identified and gathered. The first part of this process is to define what is actually required.

Define the requirement

It is important to define the requirement, so you know exactly what information is needed. Often this starts with the outputs required from the system. Without the requirements, there might not be enough data gathered to make the system work, or there might be too much detail in the information produced, adding to the cost and processing with no useful benefit.

Establish sources of information

When the requirements are known, you need to establish the sources of information, which is where the data is to be found.

The sources need to meet the requirements, with enough detail and accuracy as well as meeting any other constraints such as cost or timeliness.

Define other factors to be considered

There may be other factors or constraints that need to be considered, these need to be understood and defined.

Timeliness is often important as information has to be available when it's needed. Late information can be totally useless, especially if decisions need to be made on it.

Select information

It may be necessary to select information used in the system from a wider collection of data, for example if the information is sourced from questionnaires there might be some sheets which have been badly completed and are obviously unreliable, so should be excluded from the data used.

4.3 Analyse information

When analysing information you need to look for validity, accuracy, currency and relevance to ensure the information is reliable and useful.

Validity

Valid information is useful for your purposes because it meets the requirements.

Accuracy

Accuracy is always useful and is helpful towards producing reliable outputs from the information system. Accuracy can be lost when data is transferred from paper to a computer system by mis-typing or from scanning errors using **OCR** or **OMR** technologies.

Key terms

OCR – stands for optical character recognition. When a document is scanned into a computer system the software translates the scan into a document with editable text.

OMR – stands for optical mark recognition (OMR). When multiple-choice sheets are scanned into a computer system the software translates the respondents' marks into a spreadsheet or database.

Currency

Currency is how up-to-date or current the information is. Obviously out-of-date information is not nearly as useful as current data.

Relevance

Information needs to be relevant. If an organisation produces a range of cakes then information on last year's car sales by another organisation is not relevant or useful.

Identify alternatives

There might be alternative sources of information you can identify that would be useful to the organisation, saving some or all of the cost of gathering information and processing.

4.4 Management information

Management information systems produce information which is usually available both on-screen and in the form of written reports.

Assessment activity 3.3

You are working in the publicity department office of a large bank as a junior publicity and media officer. You are now required to carry out some research to identify suitable target locations for the next road show tour which is targeting saving and investment opportunities for young professionals.

These locations should be in areas where there are likely to be substantial numbers of young people in professional employment.

This research will produce some reports identifying likely locations for the road show to set up.

Identify a dataset to process into information for your reports. The data you will need for these tasks can be found using the nomisweb data (go to www.heinemann.co.uk/hotlinks and enter the express code XXXX). Alternatively, you may use any other sources you think appropriate. Download your data into a spreadsheet or database.

- 1 Produce some notes on where the dataset was found and why it was selected. **P6**
- 2 Use a spreadsheet or database for processing the data you find into useful management information identifying some suitable locations where the road show is likely to find young professional workers. **P7**

PLTS

Text to follow from author

Reports

Information is often printed as a report. There are many types of report, according to the varied needs of different types of organisations.

The sales report is regular and holds very important information for every organisation that sells products or services. This information is the starting point for many important decisions such as how much stock is needed, what staffing is required and much, much more.

A college may use a report with enrolment statistics for basic planning, such as how rooms and teaching staff will be allocated during the academic year.

A new business could benefit from a marketing analysis report to help understand the marketplace and how to position the business. This can be useful for decisions such as whether to set up as a brick (with premises) or click (using the internet to sell) business, or a mixture of these approaches.

P6 **P7** **M3** **D2**

BTEC

- 3 You have been asked to produce a front sheet to your reports explaining how the information you generate is valid, accurate and useful. This will ideally be a single page, two pages maximum, so management reading the reports can understand the validity of your findings. **M3**
- 4 Produce a substantial email to your team leader justifying the information you selected to support these business decision-making processes. **D2**

Grading tips

- Be careful to select information that is substantial enough for your reports **P6**
- The IT tools to produce management information could be a spreadsheet, database or other MIS tool **P7**
- The reports you generate must be valid, accurate and useful **M3**
- To justify the information you selected, you could explain what information you rejected with reasons **D2**

Functional skills

Text to follow from author



Shahanara Begum

Systems Analyst



Hi, my name is Shahanara. I'm a systems analyst in the regional office of a large insurance company. We have a team of four systems analysts here. Our main role is to help design new IT solutions to improve business efficiency and productivity.

We work closely with the user departments, examining the existing business models and flows of data, discussing our findings and designing appropriate improved IT solutions. We then produce an outline design and costing for a new IT system, defining the operations the system will perform and how data will be viewed by the user. Once it is approved, we work closely with the programming team to implement the solution. I spend a lot of time in meetings, liaising with users and department managers.

Our existing systems work well, but we still need to keep analysing them, identifying options for potential solutions and assessing them for both technical and business suitability. The outcome of analysis is to create solutions to quite complex problems, with proposals for modified or replacement systems, feasibility reports and ensuring that budgets are adhered to and deadlines met.

I am also involved in writing user manuals and providing training to users of our new systems.

It is good to have a role in the organisation that actually makes a difference. I help to give managers better understanding to aid their decisions and to make our users more productive.

Think about it!

- 1 Why do you think Shahanara needs to be in lots of meetings?
- 2 In what ways do you think an information system might be improved?
- 3 Why do you think a systems analyst is expected to write user manuals?

Just checking

1. What are examples of primary and secondary data?
2. What are the three offences of the Computer Misuse Act 1990?
3. What might appear in a code of practice for Internet usage?
4. What health and safety issues might apply to an information system?
5. What are the typical benefits of an MIS?
6. What is predictive modelling?
7. What are the possible disadvantages of using secondary data?
8. What is the difference between data and information?
9. How might a marketing department use an information system?
10. How might a finance department use an information system?



Assignment tips

<To be supplied by author at 1st proof>