Commercial Data Processing
What is Commercial Data Processing?

Commercial Data Processing is the use of computers in business and commerce.

Many different types of manual jobs can be done more efficiently by computers or by using computers:

- Computers can work out a company's payroll
- Computers can be used to file information on disc or tape
- Computers can be used to read data quickly (barcodes, etc)

Why Use Computers?

The main advantages of using a computer are:

**Speed**

Computers can process data and perform calculations much faster than humans can.

**Accuracy**

Computers don't make mistakes. Computers cannot lose information or file it in the wrong place.

**Sharing Information**

Information can be held on a central computer system and accessed and updated by many remote users at the same time. This is known as an ON-LINE SYSTEM.

**Volume**

Information can be stored on discs or tape without taking up as much space as storing the information on paper and storing in a filing cabinet.

**Repetition**

Jobs which involve a lot of paper work can be very boring for humans. Computers can be used to do these tasks without getting bored or complaining.

Management Information

‘Single Entry, Multiple Use’

It is inefficient to enter similar information more than once, e.g. customer name and address. These should only be entered once but can be used many times over, for many different purposes.

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The Data Processing Cycle

Computers are used in business to take raw data and process it into a form of information which is useful to the business.

In business, this is known as The Data Processing Cycle:

The Difference between Data and Information

Notice that three of the stages above are about ‘data’ and one is about ‘information’.

So, what’s the difference between data and information?

Simple, data is just raw figures or numbers.

Data becomes information once we know what it means.

For example, 23,500.00 is just data.

However, “23,500,000 iPods sold in 2006” is information. It has meaning.
Data Input

There are several methods of passing data into a computer. The following is a list of those that can be used by businesses such as shops and banks:

Bar Codes

This is a series of black and white vertical lines that can be read using a laser or a light wand.

Barcodes can be read quickly and accurately by the computer but cannot be read by a human as the data is binary.

A Bar code contains information about the manufacturer, country of origin, item code and check digit.

Mark Sense Cards

The user marks a specially prepared document with a pencil or ink. A machine called a reader is able to read the marks left on the paper using special photo-cells. This is useful for marking multiple choice exams papers, football or lottery coupons.

Magnetic Stripes

These are strips of magnetic tape which are normally used on the back of credit cards. A magnetic reader is used to get the data from the card.

Magnetic stripes have all the advantages of barcodes but can be damaged easily by magnets. They are sometimes used as pass cards to secure areas of a building.
Magnetic Ink Character Recognition (MICR)

This uses a special magnetic ink which can be read by the computer.

It requires the document with MICR to be printed using a special printer.

The reader can read the information on a document even if it is dirty or creased. They are normally printed onto bank cheques.

MICR documents can be read by humans. MICR is only used with 1 typeface.

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Optical Character Recognition (OCR)

OCR is used for reading characters from paper, using scanners, and inputting them into a computer. The shapes of different characters are detected by shining light on them, and sensing the patterns of reflected light. Each pattern is compared with a set of stored patterns until the closest match is found.

Scanners were originally designed to scan pictures but they can now be used to scan text into a word processor.

OCR can save a lot of typing if you need to enter a printed document onto a word processor!

Smart Cards

Smartcards have a microchip and on-board memory instead of a magnetic stripe to hold information.

The microchips can hold a lot more data than magnetic stripes and are much more difficult to forge. Because of this they are already beginning to replace the magnetic stripes on bank cards and credit cards (although many for now have both storage methods).
Task Sheet 1

1. Name and describe three reasons for using computers in large businesses.

2. Name the four stages of the ‘Data Processing Cycle’.

3. What is the difference between data and information?

4. Name four methods of collecting and inputing data.

5. What does MICR stand for? Give two advantages of using MICR to enter data.

6. Suggest a use for mark sense cards.

7. What information might be contained in a bar code?

8. Why does a bar code not contain information about the price of a product?

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9. Describe what is meant by the term ‘Management information’.

10. What does OCR stand for? What hardware is required in an OCR system?

11. What advantage does the use of ‘smart cards' have over magnetic stripes?
Data which is input to computers must be **accurate**. Mechanical input is more reliable than human input. Data typed in at a keyboard is more likely to contain errors than that input using a bar code reader. One way to reduce human error is double typing.

**Double Typing**

Double typing involves two different operators entering the same data. The computer compares both sets and if there are any differences the computer alerts both operators and the data is entered again.

The main disadvantage of double typing is that it is expensive – you have to employ more people! Many companies prefer to trust the accuracy of one operator.

Checks are also made on the data to make sure the data is **allowable**. If the data is not allowable, the program stops and lets the operator know why it is not acceptable so that it can be checked and entered again.

Here are some such checks:

**Range Checks**

These make sure the data is within a certain range of values. It checks that the data is not too large or too small.

E.g. if an average person's age was input it would be unlikely to be above 120 and never less than 0. A range check would make sure that the data was within this range.

**Field Checks (data type checks)**

These used to see if the data is of a certain type.

E.g. they detect numbers where letters should have been and vice versa.
Check Digits

These are often added to numerical data to check that the data has been correctly entered.

The check digit is calculated from the other numbers in the data and added to the end of the data.

The computer recalculates the check digit when the number is entered and compares the result of this calculation to the check digit at the end of the number.

If they are different, the data has been entered wrongly and so has to be entered again.

Presence Check

This checks to see that an important item of data has not been completely missed out.

(I said ‘presence’…
… not ‘presents’!)

Categories of Data Check

Data Verification

This is check to see if data which has been input is accurate.

Examples of data verification include Double Typing and Check Digits.

Data Validation

Validation checks are made on the data to make sure the data is valid, i.e. allowable.

If the data is not valid the program stops and lets the operator know why it is not acceptable so that it can be checked again.

Examples of data validation are Field Checks and Range Checks.
Task Sheet 2

1. Why is ‘double-typing’ rarely used as a method of checking the accuracy of data?

2. What is the difference between a ‘range check’ and a ‘field check’?

3. How does a ‘presence check’ work?

4. Explain in detail how a check digit ensures that data has been entered correctly.

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5. What is meant by the term data validation? Give one example of this type of data check.

6. What is meant by the term data verification? Give one example of this type of data check.
Processing and Storage of Data

Interactive Processing (Real time processing)

The computer is constantly kept up to date with data supplied by the operator. All data is processed as soon as it is entered.

In a sense, the computer actually communicates with the operator. This type of processing is used where an immediate result is required.
E.g. Operating bank accounts, booking holidays.

Backing up data

Often, an organisation's most valuable asset is its information. Details on customers may have taken many years to build up.

If any critically important computer system develops a fault it is vital that data is not lost when a problem arises. An effective backup system is essential to almost every modern organisation.

- A simple method of backing up data might involve a ‘backup schedule’, where a backup copy of data is made every night as part of an automated process.
- The backup copy should then be stored ‘off-site’ at a different location in case of fire.

A more complicated process (for an interactive processing) system might work as follows:

- As data is stored to a hard disk attached to the computer system, it is also automatically copied to a second hard disk.
- If there is a problem with the first hard disk, the second disk automatically kicks in and the data is still instantly available.
Multi-user database

A multi-user database is a database that allows many users access at the same time. If a user has the appropriate access privileges, he or she will be able to update the data for all other users.

Sequential/serial access

When a system uses sequential access to data, it goes to each record in a file one after another in sequence. Sequential access is commonly used when recovering data from taped backup systems.

Random/direct access

A system using random/direct access goes directly to the data it requires. As we have seen, the computer systems at the airport use interactive processing, which means that data is processed immediately. This requires direct/random access to the data held on backing storage and is used throughout the airport computer system.

Electronic Point of Sale (EPOS)

An EPOS system consists of a laser scanner which is able to read barcodes quickly. The details are then sent to the shop's main computer system, which can look up the item code of the barcode and send the correct price to the terminal (cash register).

As each item is scanned, the main computer can decrease the level of stock which is held in the shop and alert the manager when the stock levels fall low.

<table>
<thead>
<tr>
<th>Benefits to customer</th>
<th>Benefits to retailer</th>
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<tbody>
<tr>
<td>Increases checkout accuracy</td>
<td>More efficient checkout operation</td>
</tr>
<tr>
<td>Fully itemised receipt</td>
<td>Can monitor cashier</td>
</tr>
<tr>
<td>Faster checkout service</td>
<td>Monitors stock levels</td>
</tr>
</tbody>
</table>
Electronic Fund Transfer at Point of Sale (EFTPOS)

Electronic funds transfer (EFT) transfers money directly between bank accounts using computer systems. When people use their bank debit card they are using EFT.

These are special credit cards (Switch cards) which are accepted by many shops. The system works as follows:

Card is handed to cashier when the bill is due.

The cashier passes the card through a reader which reads the customer details from the magnetic stripe on the card. The total value of the bill is then entered on the keyboard.

The customer types in a special number (PIN) on a keypad and checks the amount of the bill.

The computer then checks the customer has the required amount of money in their account and then authorises the money to be passed from the customer’s account to the shop’s account.

Advantages of EFTPOS

The main advantage of this system stems from the fact that the customer does not have to carry money.

This reduces robberies at the supermarket and thus benefits both employees and customers.

Also, the seller receives instant payment as funds are immediately transferred from one bank account to another.

Disadvantage of EFTPOS

The ability to transfer funds electronically from one bank account to another has resulted in a massive increase in computer crime, on-line fraud and identity theft.
E-commerce

E-commerce is the use of computer networks to allow people to buy and sell goods. Rather than physically go out shopping, people can now browse, buy and pay for goods using online systems.

The advantages of buying online to the customer:

- The ‘E-buyer’ can shop 24 hours a day and compare prices and availability of items.
- Travellers can enquire about seat availability and then book their seats without having to leave the house and visit a travel agent.

The advantages of buying online to the retailer:

- Less high street stores are needed, e.g. travel agencies, keeping costs and prices to a minimum
- by offering this service across the internet they can contact customers all around the world
- by enabling people to pay online using bank and credit cards they save the cost of having staff process cheques or cash.
- Payments can be received instantly.

Unfortunately, the widespread use of E-commerce has resulted in on-line fraud becoming a worldwide problem. Care should always be taken when providing personal details such as banking information to on-line organisations. A properly secure and encrypted web URL will always start with ‘https’ and will show a padlock icon in the browser window as shown below.

https://www.bankofscotlandhalifax-online.co.uk
Hardware – mainframe and terminals

A typical commercial data processing system might consist of a large mainframe computer with many terminals connected to it for data entry and output.

A mainframe computer is a very powerful computer with super-fast processors and a vast amount of memory. Large hard disks and tape drives are used for storing and backing up data.

Terminals are often simple machines with no real processing power of their own. They simply allow users to connect to the mainframe computer in order to carry out tasks. Each terminal might be equipped with a keyboard, mouse and monitor. However, all the processing is actually carried out by the mainframe computer.

It is possible for a single mainframe to support tens of thousands of terminals. An everyday example of such a system would be the cash machine network belonging to a large bank.

Costs of CDP

The costs of setting up and then maintaining a large computerised organisation can be enormous.

<table>
<thead>
<tr>
<th>Initial Costs</th>
<th>Running Costs</th>
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<tbody>
<tr>
<td>Cost of hardware - computers, printers, backing storage and consumables.</td>
<td>Staff wages</td>
</tr>
<tr>
<td>Cost of installation</td>
<td>Replacing consumables (paper, disks, ink)</td>
</tr>
<tr>
<td>Software (can be as high as hardware costs)</td>
<td>Repairs and spare parts for computers</td>
</tr>
<tr>
<td>Staff training</td>
<td>Electricity and telecommunications bills</td>
</tr>
</tbody>
</table>
Task Sheet 3

1. What is meant by the term ‘Interactive processing’? Give two examples of when this type of processing would be required.

2. What essential activity should every organisation carry out in order to avoid loss of data due to mechanical breakdown or fire?

3. What does EPOS stand for?

4. Describe two advantages to the customer, and two advantages to the retailer of using an EPOS system.

5. What does EFTPOS stand for and how does EFTPOS work?

6. Describe an advantage and a disadvantage of EFTPOS.

7. The growth of the Internet has resulted in widespread use of ‘E-Commerce’. Describe one advantage to the customer and one advantage to the retailer of using ‘E-Commerce’.

8. Describe one concern that has grown due to the widespread use of ‘E-commerce’.

9. What two things allow a user to know that personal data is being submitted securely to a web site?

10. Name three initial costs and three running costs associated with commercial data processing.

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11. A database system is said to be ‘multi-user’. What is the advantage of such a ‘multi-user’ system?

12. What is meant by the term serial access? Name an example of a serial access backing storage device.

13. What is meant by the term ‘direct access’? Name an example of such a backing storage device.
Types of Career

The Programmer

- designs & writes the programs used to process data and also modifies existing programs to meet new demands.
- produces program documentation.
- maintains programs by correcting errors and making modifications.

The Systems Analyst

- converts the current manual system into a computerised system.
- decides on the hardware and software required.
- helps to implement the new system.
- evaluates the new computer system.

The Engineer

- carries out regular maintenance.
- repairs system when it breaks down.

Network Manager

- controls who has access to the system by giving users their unique usernames and passwords.
- controls access privileges for users.
- controls installation of new hardware and software.
Task Sheet 4

Describe the main tasks carried out by the following personnel:

1. The programmer
2. The systems analyst
3. The engineer
4. The network manager
Data Security

Data security is important to prevent unauthorised access and misuse of information. Most organisations have security controls, which should include:

Physical security
- Electronic locks to rooms and doors (swipe cards).
- Restrictions on the numbers of people who have access to the computer.
- Shredders to destroy printed output.

Software security
- Passwords to gain access to information. It is possible to have passwords which have different levels of security clearance and restricts the amount of information available to the user. Information is made available on a ‘need to know’ basis.
- Audit trails - to check on possible fraudulent activities by tracing financial transactions. One area of concern is that banks are reluctant to admit any kind of computer fraud as it would be a public admission that their system is not ‘fool-proof’.

Mailing Lists

Mailing lists are details on customers sold from one company to another. This sometimes results in you receiving 'junk mail’ from companies from whom you have never bought any goods.

Advantages

Mailing lists allow companies to keep in contact with a large number of customers or potential customers.

Information about special offers and other promotions can be advertised directly.

Disadvantage

Many people find this annoying and even an invasion of privacy. You have the legal right to ask that your name is removed from these lists if you so wish.
**Computer Crime and Fraud**

When criminals break the security systems surrounding the data held on people by companies they could commit a whole range of crimes including:

- copying the IDs and passwords that allow access to computers (hacking)
- copying sensitive data about people and companies
- installing viruses
- stealing money from the accounts of people and businesses

Computer crime is now a major international problem and affects all of us, even if you don’t own or use a computer yourself!

**Commercial Data Processing and The Law**

**Data Protection Act**

The Data Protection Act requires that nearly all businesses who keep personal information on computer must register giving name, address, description and purpose for holding data, who it will be open to and to whom it may be transferred.

- The business is required to keep all personal data secure, accurate and only hold the data for as long as is necessary.
- You have the right to see information about you and have it changed if it is wrong.

Only certain government organisations are exempt – including the Inland Revenue (tax), MI5 (national security) and the police.

**Computer Misuse Act**

One of the items in this act concerns computer users.

- It is illegal to access, copy or change information on a computer system without the authorised permission of the owner. This has made computer ‘hacking’ illegal.
- It is also illegal to write a computer virus or knowingly be responsible for distributing one to others.
Task Sheet 5

1. Describe two methods of keeping a computer system secure from unauthorised access.

2. Why might a list of company’s customers be of use to another company?

3. Describe one advantage and one disadvantage of the use of mailing lists by companies.

4. What legislation exists to protect the privacy and accuracy of personal data?

5. Which two examples of computer crime is the Computer Misuse Act designed to prevent?

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6. State three types of computer crime and describe the precautions that can be taken in order to prevent them.