



ICT Applications

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Communication Media

What is communication media?

- Communication media describes the **tools and channels for sharing of information** between a sender and a receiver
- Communication media can be both electronic and physical

Newsletters

- Periodic **publications**, often used to inform, educate, or entertain subscribers about specific topics
 - Usually distributed through email or as printed copies
 - Suitable for organisations, schools, and clubs to keep members up-to-date

Advantages	Disadvantages
<ul style="list-style-type: none"> Cost effective Measurable results Easy to personalise Targeted Increases brand awareness 	<ul style="list-style-type: none"> Low engagement SPAM filters can unintentionally block Limited interactivity Can get lost in a busy inbox

Posters

- Visual presentations** that convey information or promote events or products
 - Combine text, images, and graphics to grab attention

Advantages	Disadvantages
<ul style="list-style-type: none"> Cost effective Wide reach Versatile Long shelf life in the right space 	<ul style="list-style-type: none"> Limited information Lack of interactivity Can be removed/defaced Cannot update

Websites

- Online platforms** that provide information or services
 - Accessible through the internet using a web browser

- Useful for businesses, educational institutions, and individuals to share information, sell products, or offer services

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Media rich ▪ Links to other websites ▪ Easy navigation ▪ Global audience 	<ul style="list-style-type: none"> ▪ Can be hacked ▪ Risk of phishing ▪ Maintenance can be expensive



Your notes

Multimedia presentations

- **Digital presentations** that combine various forms of media, such as text, images, audio, and video
 - Used in education, business, and entertainment to present information in a visually engaging way

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Media rich ▪ Interactive ▪ Transitions/animations to highlight key information 	<ul style="list-style-type: none"> ▪ Special equipment required ▪ Often required internet access ▪ Easy to create a bad presentation ▪ Visuals can take focus from the overall message

Audio & Video

- **Sound recordings**, such as podcasts, music, and radio shows
 - It can be streamed or downloaded for offline listening
 - Suitable for providing information, entertainment, or educational content
- **Moving images with or without sound**, used for entertainment, education, or promotional purposes
 - Can be streamed or downloaded for offline viewing
 - Typical platforms include YouTube, Vimeo, and social media websites

Media streaming

- **Real-time transmission** of audio and video files over the internet
 - Allows users to access content without downloading it to their devices
 - Popular services include Spotify, Netflix, and YouTube

E-Publications

- **Digital versions of printed materials**, such as eBooks, eMagazines, and eNewspapers
 - It can be read on electronic devices, such as eReaders, tablets, and smartphones
 - Offer benefits like portability, searchability, and adjustable text size



Your notes

Mobile Communication

What is mobile communication?

- Mobile communication involves **transmitting information between people and devices** using **radio waves**
- Smartphones use subscriber identity module (**SIM**) cards **to link the devices** to a **network carrier**, allowing them to make phone calls and send messages
- Smartphones include features such as:

Feature	Description
SMS messaging	<ul style="list-style-type: none">▪ Quick communication▪ Messages are stored on the device and can be read at any time▪ Use virtual keyboards and predictive text
Phone calls	<ul style="list-style-type: none">▪ Simple voice communication▪ Requires cellular reception
Voice over internet protocol (VoIP)	<ul style="list-style-type: none">▪ Audio & visual communication via the internet▪ Requires extra apps installed on the devices▪ Can make & receive calls via smartphone, tablet and computers▪ Requires a forward facing camera for video calls
Accessing the internet	<ul style="list-style-type: none">▪ Requires cellular reception to access on the move▪ Web pages are optimised for smartphone access▪ Automatically used Wi-Fi when in range and connected
Mobile payments	<ul style="list-style-type: none">▪ Uses NFC

Camera	<ul style="list-style-type: none">▪ Smartphones have built-in cameras for video calls▪ Camera can act as a barcode scanner for QR codes
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Your notes



Computer Modelling

What is computer modelling?

- Computer modelling is **using a computer to simulate a real-life system** in order to be able to **study the behaviour** in different scenarios
- The simulation **uses a model** to help **predict how the system will work** in unusual circumstances
- Examples of modelling application include:
 - **Personal finance**
 - **Bridge and building design**
 - **Flood water management**
 - **Traffic management**
 - **Weather forecasting**

Advantages and disadvantages of computer modelling

Advantages	Disadvantages
<ul style="list-style-type: none">▪ Cheaper than having to build the real thing▪ Easier to try out a range of different scenarios▪ Safer, can simulate hazardous environments e.g. power station▪ Faster, can speed up variables that would impact on results e.g. climate change▪ Testing can be done before real-life construction begins	<ul style="list-style-type: none">▪ A computer model will never be 100% accurate▪ Results are only as good as the model designed and data entered▪ Possibility of human error in the design could skew results

Modelling applications

Application	Description
Personal finance	<ul style="list-style-type: none">▪ Use of a spreadsheet to test 'what if' scenarios▪ Using spreadsheet functionality to change values and see what impact is made e.g. the financial impact on a family if household income was to go down



Your notes

Bridge and building design	<ul style="list-style-type: none">Architects will use 3D computer models of bridges and buildings so that a number of scenarios can be testedIn bridge design:<ul style="list-style-type: none">How much traffic can the bridge takeThe effects of natural vibrationsThe effects of different weather conditionsWhat impact on structural integrity would an accident causeIn building design:<ul style="list-style-type: none">The effects of different weather conditionsSimulating fire evacuation protocolsWhat impact on structural integrity would a fire cause
Flood water management	<ul style="list-style-type: none">Computer models allow risk assessments to be made of high risk flooding areasUsing models and changing variables allows for the design of automated flood defence systemsVariables would include:<ul style="list-style-type: none">different rivers and sea inletstime of the dayprevious flood behaviourspossible obstructions etc.An automated system allows for:<ul style="list-style-type: none">Real-time monitoringData collectionFaster response to changing conditions e.g. advance warning to people
Traffic management	<ul style="list-style-type: none">Computer models allow users to see the effect of traffic and accidents on major road networksThe data collected can be used to optimise the traffic light times at different junctionsData collected could include:<ul style="list-style-type: none">Time of dayNumber of vehicles passing the junction from all directions



Your notes

	<ul style="list-style-type: none">▪ Factors that effect the flow of traffic e.g. pedestrians crossing, accidents etc.▪ After successful modelling has been completed, optimised systems can be built and installed
Weather forecasting	<ul style="list-style-type: none">▪ Sensors are used collect data and sent to a central computer▪ Data collected could include:<ul style="list-style-type: none">▪ Air pressure▪ Wind speed▪ Air temperature▪ Humidity▪ The computer model can then be used to predict weather patterns for the next few days▪ Actual weather is compared to the modelled data to check for accuracy and identify any areas in the model to modify



Computer Controlled Systems

What is a computer controlled system?

- A computer controlled system uses computers and software to control, monitor, and manage processes, machines, or devices
- The effectiveness of computer controlled systems depends on the quality of software, hardware, and input data

Advantages and disadvantages of computer controlled systems

Advantages	Disadvantages
Increased efficiency and productivity (due to working 24/7)	High initial investment and maintenance costs
Greater precision and accuracy	Job displacement for human workers
Ability to operate in hazardous environments	Dependency on reliable software and hardware
Reduced human error and fatigue	Lack of flexibility and adaptability to unexpected situations
Can work with large or delicate items	Requires costly backup systems

Robotics

What is robotics?

- Robotics is the principle of a robot **carrying out a task** by **following a precise set of programmed instructions**
- Robots can be categorised into **two** groups:

Dumb robots	Smart robots
Repeat the same programmed instructions over and over again (no AI)	Carries out more complex tasks and can adapt and learn (AI)
E.g. Car assembly line	E.g. Assisting surgeons in delicate procedures

- The development of artificial intelligence, including the increased use of machine learning and robotics raises **ethical** and **legal** issues such as:

- **Accountability**
- **Safety**
- **Algorithmic bias**
- **Legal liability**



Your notes

What is the role of robots?

- Robots play a crucial role in many areas such as:

Scenario	Role	Advantages	Disadvantages
Industry	Quality inspector	Advanced vision to inspect products for defaults, improving quality control	May not work on defects that might require human judgement
Transport	Warehouse worker	Efficiency in finding, moving and packing, less reliable on manual labour	High infrastructure costs and potential safety concerns for human workers sharing the same space
Agriculture	Planting & seeding machine	Precise planting (optimum depths and distances)	High upfront costs, may struggle with uneven terrain and changing weather conditions
Medicine	Rehabilitation therapist	Personalised physical therapy exercises to aid recovery	Doesn't provide emotional support
Domestic	Sous chef	Assists with meal prep by doing basic duties (chopping, measuring and following basic recipes)	Limited ability and capabilities
Entertainment	Educational robot	Interactive learning experiences for children, increased engagement	High cost, cannot replace the guidance of human teachers





Worked Example

The European Space Agency (ESA) is building a new space telescope to orbit the Earth and search for distant galaxies. The ESA is using computer controlled robots to build the lens of the telescope.

Discuss the advantages and disadvantages of using computer controlled robots rather than humans to build the lens.

[6]

Answer

Max 4 of:

Advantages

Robots can work in sterile areas where humans would need protective clothing [1]

Robots can easily be used for transferring large delicate items [1]

Robots can work 24/7 / continuously [1]

Cheaper in the long run/robots not paid [1]

More accurate as the lens needs to be precise / higher quality of lens [1]

More frequent checking of the equipment/lens [1]

They do boring/laborious work [1]

Issues can be found more quicker [1]

Task/job can be carried out far quicker [1]

Max 4 of:

Disadvantages

Very expensive to buy / higher in the short term [1]

Maintenance is very expensive [1]

Difficult to re-program when changes are made [1]

Requires expensive backup systems [1]

They replace skilled workers, leading to de-skilling [1]

They need constant observation which increases the cost of maintenance crews [1]

If something goes wrong, it may be difficult to find the error [1]



Examiner Tips and Tricks

Some of the advantages/disadvantages listed above don't always apply depending on the scenario. Choose the ones appropriate for the scenario in the question

You can't get full marks by only focusing on advantages or disadvantages - make sure you know both

Don't use short answers like 'it's expensive' - explain your answer



Your notes



School Management Systems

What is a school management system?

- A school management system is a **software solution** designed to **centralise and streamline schools administrative tasks**
- **Data is stored centrally** to improve efficiency
- Processes that can be included in a school management system include:
 - **Registration & attendance**
 - **Recording learner performance**
 - **Computer aided learning (CAL)**

Advantages	Disadvantages
<ul style="list-style-type: none">▪ Streamlined administration and record-keeping▪ Improved communication between teachers, students, and parents - this can be automated▪ Centralised access to information and resources▪ Data-driven decision-making and insights for teachers and administrators▪ Information is more up to date▪ Information can be obtained quickly in an emergency▪ Patterns of absence can be found quickly which helps to tackle truancy/lateness	<ul style="list-style-type: none">▪ Cost▪ Transition can be time consuming and complex▪ Training is required▪ Dependant on technology▪ Data security concerns

Registration & attendance

- Traditional ways of recording attendance and registration involve a teacher manually inputting data
- The use of IT systems makes other methods possible, for example magnetic stripe cards and/or biometrics

Recording learner performance

- Using IT systems gives teachers a plethora of information which can be analysed to identify class and individual strengths and areas for development
- Data can be used to inform teaching strategies



- Data can be used to provide individual progress reports
- Data can be used to critically analyse class/teacher performance

Computer aided learning (CAL)

- The use of computer aided learning is designed to enhance and not replace traditional classroom teaching
- CAL allows students to work on individual development areas
- CAL can provide interactive revision resources to aid exam performance



Worked Example

A school is setting up a new computerised system to manage many aspects of the school administration.

a. Describe how this system can be used to manage student registration and attendance.

[3]

b. Describe the benefits of using this system.

[2]

Answers

a. three of:

Student scans a card // teacher records the student as present on the computer system [1]

The system records the time of arrival [1]

The system sends the data to the school administration database [1]

The data is searched in the database [1]

If a student arrives after a certain time the student's attendance record is flagged as late/absent [1]

Attendance/lateness records are automatically printed/sent to parents [1]

Letters/texts are automatically sent to parents to show the absenteeism/lateness of students [1]

Parents can log in into the system to check student's attendance/lateness records [1]

b. two of:

The information is more up to date [1]

Information about the student can be obtained quickly after a fire/emergency [1]

Information regarding patterns of absence can be found quickly [1]

Helps to tackle truancy/lateness [1]

Parents can be informed automatically about patterns of lateness/attendance [1]

Lateness is entered consistently in the school [1]

Automatic lateness reports for the form tutor can be generated [1]

Accurate/up to date records if there is a fire [1]
Speeds up the process as attendance is not marked manually [1]



Examiner Tips and Tricks

It is vital that you read the question carefully and any answers relate directly to the context in the question



Your notes



Online Booking Systems

What is an online booking system?

- An online booking system is a computer system that **allows customers to purchase tickets for events online**
- Examples of industries that make use of these systems include:
 - **Travel** - booking flights, hotels and package holidays
 - **Music** - Reserving tickets for live music events
 - **Film** - Booking cinema tickets, allowing customers to pick a seat
 - **Sport** - Purchasing tickets to sporting events, choosing their view

Advantages and disadvantages of online booking systems

Advantages	Disadvantages
Convenience and accessibility (24/7 booking)	Potential for technical issues and downtime
Instant confirmation and ticketing	Possible security and privacy concerns
Ability to compare prices and options	Transaction and booking fees
Promotions and personalised offers	Impersonal and less tailored customer service
Faster to change/cancel	Internet connected devices required
Automated reminders via email/text	Staff may lose their job
Repeated bookings can easily be made	
Staff are freed up to do other things	



Case Study

Reserving a seat to watch a film at the cinema.



Your notes

After the user logs in the following process takes place

1. Customer selects the film they want to watch
2. Customer chooses a date
3. The database is searched and times and availability are displayed on the screen
4. Customer chooses a suitable time
5. The screen seating chart is displayed, showing available/taken seats
6. Customer clicks on an available seat
7. Total price is displayed on the screen
8. Customer can choose another seat or click confirm to continue to payment
9. Seat(s) are temporarily made unavailable for booking by any other user
10. Customer checks personal details are correct and enters payment information
11. Payment is taken and confirmation message is displayed
12. Payment receipt and QR code (e-ticket) are emailed
13. Database is updated to make seats unavailable



Worked Example

RockIT Airlines representatives use a computer booking system to book flights for customers. A representative from the airline types in the customer reference number, the number of passengers, departure time, departure date, departure airport and the destination airport.

Describe the processing and outputs involved in making the booking.

[6]

Answer

Six of:

Display flights available [1]

The booking database is searched for the customer reference number [1]

A matching record is retrieved [1]

Details of the customer are displayed on the screen [1]

The booking database is searched for matching departure airports [1]

The booking database is searched for matching destination airports [1]

If the flight correct, the date/time found [1]

Search if seats/tickets/flights available [1]

If unavailable error message output [1]

Outputs the price [1]

If seats are available, flags seat as booked [1]

If not booked then the flag removed [1]

Reduces the number of seats/tickets available by the number booked [1]

E-ticket/ticket details are output [1]

E-ticket/ticket details sent to customer [1]

A receipt is printed//Verification email sent [1]



ATM

What is an ATM?

- An Automatic Teller Machine (ATM) is used in the banking industry to provide customers with **convenient access to financial transactions** 24/7
- Characteristics and uses of ATMs:
 - **Withdrawing cash:** Obtain money from a bank account
 - **Depositing cash or cheques:** Add funds to a bank account
 - **Checking account balance:** View the current balance of a bank account
 - **Mini statements:** Obtain a summary of recent transactions
 - **Bill paying:** Settle utility bills and other payments
 - **Money transfers:** Sending funds to another bank account

Advantages and disadvantages of ATMs

Advantages	Disadvantages
<ul style="list-style-type: none">▪ Convenient access to banking services▪ Available 24/7▪ Reduced waiting time▪ Global access to funds	<ul style="list-style-type: none">▪ Cash withdrawal limits▪ Risk of theft or fraud▪ Limited services compared to bank branches▪ Technical issues and machine downtime▪ Some banks charge for using ATMs

EFT

What is EFT?

- Electronic Funds Transfer is a way of **moving money from one account to another**
- EFT is used primarily for:
 - **Salary deposits**
 - **Bill payments**
 - **Online purchases**

EFTPOS



Your notes

- Electronic Funds Transfer Point Of Sale (**EFTPOS**) is used by retailers **to allow customers to make purchases** using a debit/credit cards
- The process involves:
 - Data being read from the chip (using RFID / NFC if it's a contactless payment)
 - The business bank's computer contacts the customer's bank's computer
 - The card is checked if it is valid
 - If the card is valid the transaction continues
 - If it is not valid the transaction is terminated
 - An authorisation code is sent to the business
 - The price of the item is deducted from the customer's account
 - This money is added to the business' account

Advantages and disadvantages of EFT

Advantages	Disadvantages
<ul style="list-style-type: none">▪ Fast and efficient▪ Reduces paperwork▪ Lower transaction costs▪ EFT transactions can be disputed for up to 60 days	<ul style="list-style-type: none">▪ Risk of online fraud▪ Technical issues▪ Requires internet connection▪ Requires immediate funds available

Internet Banking

What is internet banking?

- Internet banking is **a secure online platform for accessing and controlling a persons bank account**
- Internet banking can be **accessed via the internet** through a secure website or by using the **bank's official app** on a smartphone
- Internet bank allows for transfers, bill payments, account management and much more

Advantages and disadvantages of Internet banking

Advantages	Disadvantages
<ul style="list-style-type: none">▪ Convenience and 24/7 access▪ Easy account management	<ul style="list-style-type: none">▪ Security of transactions▪ Requires a reliable internet connection▪ More risk of fraud

- Reduced need for branch visits (saving time and money)
- Interest rates may be better
- Easier to shop around for the best account

- Easier to make errors (typing in the wrong information)
- Physical cash can't be deposited/withdrawn



Your notes



Examiner Tips and Tricks

Sometimes the question will be about advantages and disadvantages of going to the bank rather than using online banking. Read the question carefully (you can reverse the statements in the table above)



Worked Example

Adam is paying his bill in a restaurant using a contactless debit card.
Describe the computer processing involved in Electronic Funds Transfer (EFT) using contactless cards.

[4]

Answer

Four of:

The reader checks the amount to pay is less than the contactless limit [1]

The data is read from the chip using RFID / NFC [1]

The restaurant's bank's computer contacts the customer's bank's computer [1]

The card is checked if it is valid [1]

If valid the transaction continues [1]

If not valid the transaction is terminated [1]

An authorisation code is sent to the restaurant [1]

The price of the meal is deducted from the customer's account [1]

Added to the restaurant's account [1]



Information Systems

What is an information system?

- An information system is a purpose built system **designed to collect, store, process, distribute and use information**
- In a hospital an information system would be used to:
 - **Access patient medical records**
 - **Appointment scheduling**
 - **Manage medication dispensing**
 - **Facilitate communication between doctors, nurses and other healthcare providers**
 - **Public health reporting**
- Information systems are **used by healthcare professionals** for making **informed decisions** about patient care

3D Printers

What is a 3D printer?

- A 3D printer is a machine capable of **outputting three-dimensional objects** from a **digital file**
- 3D printing starts with the **creation of a 3D model** using **computer aided design (CAD)**
- The benefits of 3D printing include:
 - **3D models can be fully customised on the computer before printing**
 - **Prototyping**

3D printers in medicine

Printing of prosthetics	<ul style="list-style-type: none">▪ Custom-made prosthetic limbs or body parts▪ Can be tailored to a patient's specific needs▪ Faster and more affordable than traditional methods
Tissue engineering	<ul style="list-style-type: none">▪ 3D printing of living cells to create functional tissues▪ Can be used to repair or replace damaged organs▪ Potential to reduce the need for organ donations



Your notes

Artificial blood vessels	<ul style="list-style-type: none">▪ 3D printed blood vessels made of biodegradable materials▪ Can be used in surgeries to replace damaged vessels▪ Allows for improved blood flow and faster healing
Customised medicines	<ul style="list-style-type: none">▪ 3D printed pills with precise doses and drug combinations▪ Tailored to a patient's specific needs and conditions▪ Potential to improve medication adherence and effectiveness



Expert Systems

What is an expert system?

- An expert system **mimics human knowledge and experience** and uses a combination of the two to **solve problems** or **answer questions**
- Examples of expert systems include:
 - **Equipment troubleshooting and repair**
 - **Technical support**
 - **Medical diagnosis system**
- Expert systems share **five** key **characteristics**

Knowledge base	<ul style="list-style-type: none">▪ A database of facts to generate rules that are used to solve problems and make decisions
Rule base	<ul style="list-style-type: none">▪ A set of rules or logic that is used to apply the knowledge in the knowledge base to specific problems
Inference engine	<ul style="list-style-type: none">▪ A program that applies the rules in the rule base to the facts in the knowledge base to solve problems
Interface	<ul style="list-style-type: none">▪ A way for users to interact with the system and provide input
Explanation system	<ul style="list-style-type: none">▪ Provides the users with explanation and reasoning behind decisions or recommendations▪ Gives a percentage probability of the accuracy of its conclusions



Case Study

Movie recommendation system

Inputs

- Indicate favourite genres/directors
- Rate movies watched (stars/thumbs up, thumbs down etc.)
- Previous movie searches (keywords)

Inference engine

- Matching similar movies to users history (based on director/genre/actor/reviews etc.)

- Filtering movies with similar characteristics as previously watched
 - Filtering movies based on what users with similar tastes have watched/liked
- Output
- Display a personalised list of movie recommendations



Your notes

Advantages and disadvantages of expert systems

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Consistent results ▪ Faster responses ▪ Can store large amounts of data ▪ Unbiased 	<ul style="list-style-type: none"> ▪ Only as good as the data entered ▪ Responses can be cold and lack human emotion ▪ Requires training to use correctly



Worked Example

Expert systems are used by doctors.

a. Describe how an expert system can be used to diagnose illnesses.

[5]

b. Name two other applications of expert systems.

[2]

Answers

a. five of:

An Interactive user interface appears [1]

Questions are asked about the illness [1]

Yes and No type answers to the questions [1]

Answers lead to other questions [1]

The inference engine searches the knowledge base [2]

Using the rules base [1]

Probabilities/possibilities of diagnoses and treatments are displayed [1]

Displays the ways it achieved the solutions/conclusions / explanation [1]

b. two of:

Mineral prospecting [1]

Car engine fault diagnosis [1]

Chess games [1]

Tax queries [1]

Careers recommendations [1]

Movie recommendations on streaming platforms [1]



Your notes



POS & EFTPOS

What is POS & EFTPOS?

- Point of Sale (POS) is a computer terminal **used to read product barcodes**
- Barcodes are used in an **automatic stock control system** in shops
- A barcode is part of a process that involves:
 - **Every barcode being assigned to a product in stock**
 - **Each product record contains its price, stock level and a description**
 - **When a barcode is matched with a record the information is transferred to the POS terminal and the price is displayed on the screen**
 - **The stock level is reduced by one**
 - **If the current stock level falls below a minimum reorder stock level it triggers a restocking process automatically**
- Electronic Funds Transfer at the Point of Sale (EFTPOS) is **how a payment is made** to purchase good or services **using a card or electronic devices** such as smartphones
- Examples of EFTPOS include:
 - **Chip and Pin**
 - **Contactless**
 - **Near field communication devices (NFC)**

Chip and Pin	Contactless	NFC
<ul style="list-style-type: none">▪ Enhance security with two-factor authentication▪ Require customers to enter a personal identification number (PIN)	<ul style="list-style-type: none">▪ Allow for faster transactions▪ Enable customers to tap their card on the terminal	<ul style="list-style-type: none">▪ Facilitate payments through smartphones and other devices▪ Increase convenience for customers

Internet Shopping

What are the advantages and disadvantages of internet shopping?

- Internet shopping is the **act of purchasing good or services online** through a website or mobile application

- Characteristics of Internet Shopping
 - Online stores accessible through web browsers
 - Wide variety of products and services are available
 - Convenient and often open 24/7



Your notes

Advantages and disadvantages to the customer

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Time-saving and convenient <ul style="list-style-type: none"> ▪ Shop from home or on the go ▪ Avoid queues and busy stores ▪ Greater product variety <ul style="list-style-type: none"> ▪ Access to the global market ▪ Compare products and prices easily ▪ Customisation options <ul style="list-style-type: none"> ▪ Personalise items or services ▪ Tailor purchases to individual preferences ▪ Potential cost savings <ul style="list-style-type: none"> ▪ Competitive pricing due to lower overheads ▪ Take advantage of online sales and promotions 	<ul style="list-style-type: none"> ▪ Security concerns <ul style="list-style-type: none"> ▪ Risk of fraud or identity theft ▪ Need to provide personal and financial information ▪ Limited physical interaction <ul style="list-style-type: none"> ▪ Can't touch or try products before purchasing ▪ This may lead to dissatisfaction or returns ▪ Delivery delays and fees <ul style="list-style-type: none"> ▪ Wait for items to be shipped and delivered ▪ Additional costs for shipping and handling ▪ Impersonal customer service <ul style="list-style-type: none"> ▪ Difficulty resolving issues or returning items ▪ Lack of face-to-face interaction with staff

Advantages and disadvantages to the business

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Can target prices, products and services at specific groups based on buying data ▪ Can update stock availability and prices more quickly than a physical store through their website ▪ Cheaper to publicise special offers rather than mail shots 	<ul style="list-style-type: none"> ▪ Increased Competition ▪ Digital Fraud and Security Concerns ▪ Technical Issues and Downtime

- International customer base
- Increased profits due to lower overheads (e.g. fewer staff)

- Costs of Delivery and Returns
- Customer Trust
- Inventory Management
- Depersonalisation
- Online Reviews
- Dependency on Internet Infrastructure
- Logistical Challenges
- Legal and Regulatory Compliance
- Increased Customer Expectations



Your notes



Worked Example

Modern supermarkets have automated stock control systems, which use data from the checkouts.

Describe how food items can be ordered by an automated stock control system so they are delivered before the stock in the supermarket runs out.

[4]

Answer

four of:

Each item is scanned/bar code is read at the POS terminal [1]

Bar code is searched in the database [1]

The quantity of products is reduced [1]

The stock database is updated [1]

When the minimum stock number/level/reorder level is reached [1]

Reads re-order quantity [1]

Goods flagged as ordered [1]

The automated stock system sends a signal to the warehouse computer to order new items [1]

The warehouse sends the items to the supermarket [1]

Re-order quantity is found in the database [1]

Flags removed [1]

The stock control system updates the stock levels in the stock control database with the new stock [1]



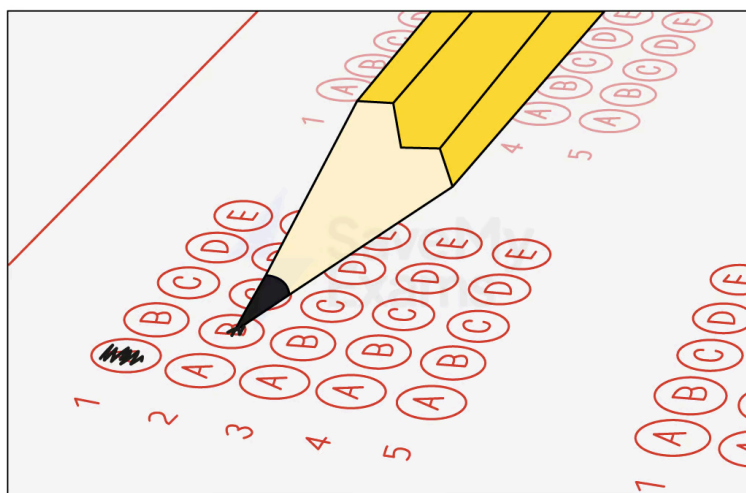
What is a recognition system?

- A recognition system is a way of using **computer technology to automatically identify** something
- Common examples of recognition systems include:
 - Facial recognition
 - Speech recognition
 - Optical character recognition

OMR & OCR

What is OMR?

- Optical Mark Recognition (**OMR**) **detects marked areas on paper** by using a special machine to read the marks
- Examples include:
 - Multiple-choice examination
 - Barcodes
 - QR codes
- **Automates data collection and entry**



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An OMR form being filled in

Advantages	Disadvantages

- Fast and efficient data collection
- Reduces manual entry errors

- Limited to predetermined responses
- Sensitive to poor marking or smudging



Your notes

What is OCR?

- Optical Character Recognition (**OCR**) **converts printed or handwritten text into digital format**
- Useful for digitising documents
- Assists in searching and editing text
- Automated Number Plate Recognition (**ANPR**) is an example of OCR
 - For example, reading number plates and controlled entry and exit at airport parking

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ No staff required ▪ Faster, no need to stop and take tickets etc ▪ Stops cars parking illegally, cannot enter without authorisation 	<ul style="list-style-type: none"> ▪ Privacy concerns as number plates are recorded ▪ Number plates can be cloned ▪ Dirty or broken number plates can not be read ▪ Lack of staff could lead to vandalism

RFID & NFC

What is RFID?

- Radio Frequency Identification Devices (**RFIDs**) use **radio waves to identify and track objects**
- Examples of where RFID can be used is:
 - **Stock tracking**
 - **Passports**
 - **Vehicles**
 - **Contactless payment**
- RFID tags are made of **a microchip and antenna** and can be either:
 - **Passive** - uses energy from the reader
 - **Active** - has it's own power source



Your notes

Stock tracking	<ul style="list-style-type: none">▪ Livestock tracking on a farm▪ Keeping track of animals<ul style="list-style-type: none">▪ Location▪ Medical data▪ Active tags would be used due to the distance involved
Passports	<ul style="list-style-type: none">▪ Passive chips in passports▪ Read by a reader to decrypt data stored on the chip<ul style="list-style-type: none">▪ Personal details▪ Photo▪ Fingerprints
Vehicles	<ul style="list-style-type: none">▪ Track progress on assembly line▪ Used on toll roads to automate payment and raise barriers▪ Entry and exit to car parks

What is NFC?

- Near field communication (**NFC**) is a subset of RFID which **allows communication between two devices** in very close proximity
- NFC can be either:
 - **Passive** - uses energy from the reader
 - **Active** - has it's own power source
- Smartphones use **active NFC to allow contactless payments** by tapping a smartphone on a reader
- Smartphones can also **exchange data** using NFC by tapping together (usually back to back)



Worked Example

A farmer has purchased a computerised feeding system for her goats. A goat has an RFID tag attached to its ear, which is recognised by the computer. The system uses a passive RFID tag.

a. Describe how the RFID tag can be activated.

[3]

b. Describe how RFID technology will be used to give the correct feed to the animal.

[3]



Your notes

Answers

a. three of:

The RFID reader sends radio waves / signals to the RFID antenna in the tag [1]

The tag sends radio wave/signal back to the reader [1]

The radio waves move from the tag's antenna to the microchip [1]

A signal is generated and sent back to the RF system [1]

The RF wave is detected by the reader which interprets the data [1]

b. three of:

The goat passes the RFID reader [1]

The RFID reader extracts data from the tag [1]

The ID is compared with data stored in the database [1]

The feed for the goat is then selected/identified / read from the database [1]



GPS

What is GPS?

- Global Positioning System (**GPS**) is a satellite system **used to track the exact location** of an object
- GPS uses **orbiting satellites** to receive, amplify and transmit signals
- **Radio frequencies are used** to communicate between satellites and ground stations
- GPS **requires a direct line of sight**



Case Study

Sat nav in a car

- The position/location of the car is calculated using GPS software
- Data is transmitted every few seconds
- An algorithm calculates the speed/location of the car
- The map is updated every few seconds

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Wide coverage area ▪ Real-time data transmission ▪ Improved communication in remote locations ▪ Accurate location tracking 	<ul style="list-style-type: none"> ▪ Expensive setup and maintenance ▪ Signal interference due to weather or obstacles ▪ Limited bandwidth and capacity ▪ Privacy concerns and potential for Surveillance

GIS

What is GIS?

- A geographic information system (**GIS**) is a powerful computer system that acts as a **database for geographic data**
- Any data that contains a **location component** can be stored, such as:
 - **Physical features** – Rivers, mountains and roads
 - **Man-made** – Buildings, utilities (electricity, water, gas)
 - **Social and economic** – demographics, crime rates and/or property value



- Two main features of a GIS are:
 - Analyse geographic data** to find patterns/trends/relationships
 - Visualise geographic data** using maps (easier to understand)
- Examples of where a GIS may be used include:
 - Assigning closest emergency services** to an emergency
 - Businesses **analysing customer demographic, competitors** and possible **gaps in the market**
 - Tracking deforestation, monitoring pollution** and **mapping wildlife habitats**

Advantages	Disadvantages
<ul style="list-style-type: none">Overlaying data based on location to reveal hidden patternsVisual representations allows for better decision makingAutomationBetter communication & collaboration	<ul style="list-style-type: none">CostOnly as good as the data it usesNeed specialised training to understand visual elements properlyData privacy concerns

Media Communication

What is media communication?

- Media communication is a system of **creating, transmitting, storing and delivering media content** using a **global network of satellites**
- Media transmission includes:
 - TV signals**
 - Radio signals**
 - Internet data**
- Media communication systems can also **act as relays, bouncing signals over a large distance**, for example:
 - Broadcasting live events** to a global audience
 - Ensuring a wider reach** to geographically hard to reach places

Advantages	Disadvantages
<ul style="list-style-type: none">Global coverageHigh bandwidthCheaper, no cables required	<ul style="list-style-type: none">Tine delays can cause audio/video sync issuesBad weather can affect quality of signal received

- Secure encrypted transmissions

- Satellites need regular monitoring and maintenance



Your notes



Worked Example

Modern-day drivers rely less on paper maps and more on satellite navigation systems (satnav).

Describe the inputs, outputs and processing of a satnav when used by a driver to reach a destination.

[4]

Answer

Four of:

Destination is input by driver [1]

Exact position of motor vehicle is continually calculated using GPS [1]

Using data transmitted from 3 / 4 satellites [1]

The on board computer contains pre-stored road maps [1]

The car's position is displayed on the map/route displayed [1]

The algorithm calculates the route from the current car's position to the destination [1]

Makes allowances for traffic jams/roadworks [1]

The car system receives regular updates on traffic conditions [1]

Outputs the journey time/ETA of journey/voice output [1]

Calculates the journey time / ETA of journey time [1]

Outputs speed limits/cameras / warning speed limit [1]