**A3 | The use, features and implications of Computer Systems for data processing.**

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| **Industry:** | *How Computer Systems/Data is used in:* |
| **Retail/Commerce:** | * Computer systems are used at checkouts in order to:  1. Scan items 2. Take payments 3. Registering points on loyalty card 4. Understanding customer preferences 5. Managing Stock purchases |
| **Financial Services:** | * Computer systems are used in Banks in order to:  1. Provide/look after customer accounts 2. Provide online banking 3. Real-time information at cashpoints (ATMs) 4. Manage bank charges 5. Manage interest  * Computers are also used for Market Research in other Financial Services |
| **Farming:** | * The farming industry has been increasing becoming automated due to computer systems:  1. Livestock kept in barns are fed automatically on a regular interval along with computer systems helping to maintain an optimum temperature. 2. Tractors using satellite-navigation systems to help control operations such as ploughing and seeding crops 3. Systems will also use sensors to detect environmental conditions such as temperature or geographical locations |
| **Manufacturing:** | * Computer systems are used to perform tasks with a degree of accuracy and reliability that humans cannot compete with/match with.  1. Car manufacturing is heavily automated, with industrial robots used for tasks such as welding and paint spraying. 2. Textile manufacturing uses automated looms and other machines to create cloth. 3. Computer systems are used to program these systems and to control production according to the demands of the market |
| **Engineering:** | * The engineering industry uses sophisticated computer systems, based on high performance desktop computers running CAD (Computer Aided Design) software to design and test components before manufacture. * The designs created in software can then be downloaded to a computer controlled machine, which then manufactures the physical product. * 3D printing also makes it possible to produce any product anywhere without the need of shipping. |
| **Science & Medicine:** | * The industry of Science and Medicine include an extensive use of computer systems, for example:  1. Exploration of computer models of theorems and for research into new drugs. 2. Medical data, which can be used to identify the most effective treatments as well as poorly performing remedies. 3. To store Patient Records 4. Many medical instruments such as CT (Computerized Tomography) scanners use dedicated computer systems to create a detailed image of a person’s internal organs from multiple X-ray images. |
| **Online Services & Targeted Marketing** | * The use of Cookies, Transactional data, Location, Device ID, Payments systems & information.   Cookies: - Plain text files that are stored on a user’s computer, which are used to store information about the user’s activity or preferences.  Transactional Data: - any data that is created, submitted etc. during a digital transaction. |
| **Data warehousing** | * A system for processing & analyzing large quantities of data |
| **Weather Monitoring & Prediction** | * The periodic or continuous surveillance or analysis of the state of the atmosphere and climate, including variables (data) such as temperature, moisture, wind velocity & barometric pressure. |

**A3 | The role of Hardware in collecting data.**

Data is entered though a form of hardware. Most likely an input peripheral:

**Keyboard:** - A common, yet effective, device for collecting data. Many data processing systems require paper-based information to be typed in so that the information becomes digital. This means it is suitable for further processing, such as sorting & arithmetic operations. Although a keyboard operator can make some typing errors, the operator can identify problems in the source documents, which an automated system may not be able to detect if the data was collected using a different method.

**A Mouse:** - The Mouse is not as versatile (the ability to adapt or be adapted to many different functions or activities.) compared to the keyboard, but it is still effective at entering information, especially in completing on-screen forms using option buttons.

**Touchscreen:** - This is a simple and effective data collection method that is often used in customer-facing systems such as bank cashpoints or automated check-in systems at GP surgeries.

**Sensors:** - There are many different types of sensors used to collect data.

1. Sensors are used in the weather forecasting system used by the Met Office, which collects data from many thousands of sensors that measure rainfall, wind speed & direction, temperature, snow, atmospheric pressure, visibility, cloud & sunshine in the UK & across the globe.
2. Sensors that are used in computer-controlled environments could range from a small building with basic central heating to a large complex industrial process such as that used for refining oil. In both cases, the sensors collect a type of data that is then passed into the controlling computer system for processing. The output from these usually goes to relays, which can switch electricity on or off to control other hardware such as heaters.

**Card Readers:** - There are used in retail checkout systems to accept credit or debit cards to make a payment. The data from these transactions is sent to the card provider to record the sale. A loyalty card could also be used to collect data for the retailer.

**Barcode Scanners:** - this is an optical scanner that can read printed barcodes, decode the data contained in the barcode and send the data to a computer.

**Cameras:** - Photos (Images) & videos are taken with cameras, which are used to communicate, to tell stories. to capture moments. The camera was and still is used as a tool or for war. This is because it is used to capture events or people. It is also a tool of everyday life.

**Swipe Cards:** - Many secure premises use swipe cards to control door entry. The data collected here records who used the door and when.

**Microphone:** - This is a device that translates sound vibrations in the air into electronic signals or scribes them to a recording medium. Microphones enable many types of audio recording devices for purposes including communications of many kinds, as well as music & speech recording.

**OMR/OCR Readers:** – Optical Mark Recognition (readers) & Optical Character Recognition for processing marks on a page to process large quantities of written responses. OMR is used for processing answers to multiple choice questions while OCR is used for processing applications such as passport forms.

**RFID:** – Radio Frequency Identification. This is the use of small tags to store information that can be powered and read by being close to a reader.

**Scanner (2D & 3D):** - A 2D scanners are usually used to make digital copies of documents or pictures. But can also be used to create a 2D image of other objects as well. A 3D scanner is the process of analyzing a real-world object or environment to collect data on its shape and possibly its appearance. This is used to construct digital 3d models, without destructive testing.

**A3 | The role of Software in collecting data.**

By standard definition, software controls hardware in a computer system.

Data collection software, a spreadsheet or database, is used to collect, store and analyses the data.

Sensors are likely to be part of a specialized system where software uses the data for a specific purpose.

Software can be used to **indicate a problem with an input**, for example showing a red light if a card swipe is not recognized.

**A3 | Data Processing Functions.**

**Aggregation: –** large amount of data is processed into one or more summaries, which can then be used to create statistics or to provide data for another system.

**Analysis: –** This is when some sort of meaning is extracted from data. For example, a supermarket sales analysis of a new product to determine a response with a more prominent display or withdrawing the item if sales do not meet expectations.

**Conversion: –**This is the change of data from one form to another. Conversions are often used in organizations to bring data held on a large central system into a form that can be easily manipulated by the user. For example, spreadsheets.

**Reporting: –** Reports are the standard means of displaying or printing the output of the data-processing system. This follows on from many data processing functions. This is so an organisation manager can understand the current state of their data or be made aware of any issues that have arisen during its processing. For example, customers reaching their credit limit.

**Sorting: –** The method of sequencing data into alphabetical or numerical order.

**Validation: –** This is used to reject anything that is wrong data. Invalid data will not be allowed though validation. For example, a product code could be two letters followed by four numbers so validation should reject anything, which is not six characters in length and/or does not follow the pattern of two letters followed by four numbers.

**A3|The impact on individuals and organizations of using and storing data across multiple computer systems.**

**Access:** - Access to data is vital for staff who need to be able to work with customer accounts or other company information. This is easy on a standalone or networked computer, but it can be difficult to synchronize data when multiple computer systems are in place, which do not directly talk to each other.

**Cost:** - Storing data across multiple computer systems can be expensive. This is due to the extra time needed to obtain information or from mistakes resulting from using out of date data on non-synchronized computer systems.

**Implementation:** - Using data from another computer system could be by an update through a communication link or batch process. Sometimes, the only way to use data from another system is to type it in using manual data entry, which is a time-consuming method that might result in human error.

**Productivity:** - Productivity will be reduced if data is stored across multiple computer systems, due to the time consumed in synchronizing data, especially if this has to be done manually.

**Security:** - Security can be easily amplified on one secure computer system. However, when they are multiple computer systems storing sensitive data, then there is more of an opportunity for hackers to access one of the systems.

**A3 | Backup Procedures.**

**Backup:** – To replace any data lost due to corruption, infection or human error. The data is stored externally on another external form of storage.

**A Full Back up**: - This is where a copy is taken of every file on the system. They often use a lot of storage space. A full backup can take a long time to create but it is faster to restore from.

**An Incremental backup**: - This is where the files that have been created, edited or modified in any way since the last backup is copied. They use less storage space and much quicker to create. But, a full system restore is slow, the last full backup must be restored, followed by every incremental backup since that point.

**A differential backup:** - This is a cumulative backup of all changes made since the last fullback. The main advantage is recovery time as it only requires a full backup and the last differential backup when restoring data.

**Onsite Backup:** - This refers to storing data on a local storage device.

**Offsite Backup: -** This refers to an external facility that stores backup data outside of the main building of an organisation. This uses storage media that is not physically located within the organizations core infrastructure.

**In house vs 3rd party services:** - If an organizations backup their own data using their own services, then when something goes wrong, for example backups are either lost or corrupted, then they are accountable for their own actions. However, if an organisation pays a third party services to handle their backups, then if something goes wrong, they can be made accountable and be forced to compensate. Furthermore, a third party service will be more experienced and skilled for the job compared to a small crew of employers in an organisation.

**A3 | Data Recovery Procedure.**

Data Recovery is the process of salvaging inaccessible, lost, corrupted, damaged or formatted data from secondary storage, when the data stored in them cannot be accessed in a normal way.

**The Procedure:**

1. Repair the storage media so it can be accessed
2. Image the storage to a new drive. Removing the data from the damaged media to the new media
3. Logical Recovery. This is the retrieving of files, partitions, MBR or file system structures.
4. Repair damaged files. Once the files have been recovered, some may need reconstituting or reconstruction.