1. **Appreciate the evolution of computer and computing technologies due to innovations.**

Computing today focuses on what computers can do; future computing will focus on what people can do (Shneiderman, 2003). However, several key innovations have shaped the evolution of computer and computing technologies, which have transformed how we use and interact with computers (Davis, 1977). Here are some key innovations that have contributed to the evolution of computing technologies:

1. **Transistors**: In the 1950s, the development of the transistor made it possible to create smaller, more reliable, and more efficient electronic circuits. Transistors paved the way for the development of the modern computer, which relies on millions of transistors to process and store data (Abbate, 1999).
2. **Integrated circuits**: In the 1960s, the development of integrated circuits, which allowed multiple transistors to combine on a single chip, made computers even smaller and more powerful. Integrated circuits led to the development of microprocessors, which made it possible to create computers that could fit on a desktop (Conte & Gargini, 2015).
3. **Graphical user interface**: In the 1980s, the development of the graphical user interface (GUI) made computers much more user-friendly and accessible to a broader range of users. The GUI allowed users to interact with the computer using icons and windows rather than entering commands using a command-line interface (Galitz, 2007).
4. **Personal computers**: In the 1980s and 1990s, the development of the personal computer made it possible for individuals and small businesses to have their computers, which had previously been too expensive for most people to afford.

PCs led to a rapid increase in the use of computers, as well as the development of a wide range of software applications (Abbate, 1999).

5. **The internet**: In the 1990s, the development of the internet transformed computing by making it possible for computers to communicate and share information globally. The internet led to the development of the World Wide Web (WWW), which made it possible to access and share information anywhere (Curran, 2012).

6. **Mobile computing**: In the 2000s and 2010s, the development of mobile computing technologies, such as smartphones and tablets, enabled people to access the internet and use various applications from anywhere, anytime (Brandenburg et al., 2013). As an example, Mobiles have led to a significant shift in how people use computers and the development of new applications and services designed specifically for mobile devices.

These are just a few of the numerous possibilities and innovations that have contributed to the evolution of computer and computing technologies. As technology evolves, we expect further advances in artificial intelligence, virtual and augmented reality, and quantum computing to transform how we use and interact with computers.

2. Describe the critical functional issues of computer structure components.

Computer structure components are the physical components of a computer system that work together to process and store data. According to Encyclopaedia Britannica (n.d.), the following are some of the critical functional issues of computer structure components:

1. **The Central Processing Unit (CPU):** The Central Processing Unit (CPU) is the core component of a computer that performs calculations and executes instructions. The critical functional issues of CPU structure relate to its performance, multitasking ability, efficiency, and compatibility with the software and applications that the system is designed to run. These issues must be carefully considered when selecting a CPU to ensure optimal functionality and performance for the computer system (The Editors of Encyclopaedia Britannica, 2020).
2. **Memory:** The memory structure of a computer system refers to the hardware components responsible for temporarily storing data and instructions that the computer processor can access quickly. The critical functional issues of computer memory structure relate to its capacity, access speed, latency, error correction, and compatibility. These issues must be carefully considered when selecting memory components to ensure optimal performance and functionality of the computer system.
3. **Storage:** The storage structure of a computer system refers to the hardware components responsible for permanently storing data and instructions that the computer system can access as needed. The critical functional issues of computer storage structure relate to its capacity, access speed, data security, data integrity, and compatibility. These issues must be carefully considered when selecting storage components to ensure optimal performance and functionality of the computer system (IBM, n.d.).
4. **Input/output devices:** Input devices, such as keyboard and mouse, allow users to input data and commands into the computer, while output devices, such as displays and printers, allow the computer to output data and information. A critical functional issue is the accuracy and precision of input devices, which determines how well the computer can capture user input. Another issue is the resolution and quality of output devices, which determines how well the computer can display and output data (GeeksforGeeks, 2021).
5. **Motherboard:** The motherboard is the main printed circuit board (PCB) in a computer system that connects all the other hardware components. The critical functional issues of computer motherboard structure relate to its compatibility, expansion capabilities, data transfer speed, power management, and stability. These issues must be carefully considered when selecting a motherboard to ensure optimal performance and functionality of the computer system (Tomljanović et al., 2013).
6. **Software:** The software comprises different layers of software that work together to perform various tasks. The critical functional issues of computer software structure include an operating system (OS), Application software, Device drivers, Libraries and frameworks and Middleware. The critical function of a software structure relates to the different software components' stability, security, compatibility, usability, and performance. These issues must be carefully considered when designing or selecting software for a computer system to ensure optimal functionality and performance (Augustyn, 2021).

These are just a few examples of computer structure components; each component is optimised for these functions and is required for the computer system to function effectively and efficiently. On the other hand, the critical functional issues of computer structure components are related to their performance, capacity, reliability, compatibility, and stability. To ensure optimal performance and functionality, these issues must be carefully considered when designing or selecting components for a computer system (Keutzer et al., 2000).

3. Identify and demonstrate the basic characteristics, functions and features of each computer system element.

According to (Goel, 2010), a computer system consists of several components that process and store data. For instance, the following are the essential characteristics, functions, and features of each computer system element:

Central Processing Unit (CPU) is the brain of the computer system. It performs arithmetic and logical operations on data and controls the overall operation of the computer system. The CPU speed is measured in GHz (gigahertz) and determines how quickly the computer system can perform tasks.

1. **Memory,** also known as RAM (Random Access Memory), stores data and instructions currently used by the CPU. It provides temporary storage for data and allows the CPU to access data quickly. The size of the memory is measured in gigabytes (GB).
2. **Storage Devices** are used to store data and programs permanently. Examples of storage devices include hard disk drives (HDD), solid-state drives (SSD), and USB flash drives. The size of the storage device is measured in gigabytes (GB) or terabytes (TB).

3. **Input Devices** enter data into the computer system. Examples of input devices include a keyboard, mouse, scanner, microphone, camera, and touch screen. Input devices allow users to interact with the computer system and provide data for processing.

4. **Output Devices** display or output data processed by the computer system. Examples of output devices include a monitor, printer, and speakers. Output devices allow users to see or hear the results of their work

5. **The motherboard** is the computer's main circuit board, which connects all components. Its primary characteristics include compatibility and form factor, and its functions include providing power and data connections for all components. Its features include support for multiple CPU and memory configurations, built-in sound and networking, and advanced BIOS settings.

6. **The Operating System (OS)** is the software that manages the overall operation of the computer system. It provides a user interface for interacting with the computer system and tends to allocate resources such as memory, CPU, and storage. Examples of operating systems include Windows, macOS, and Linux.

7. **Application Software** is a program that performs a specific task or set of functions. Examples of application software include word processors, spreadsheets, web browsers, and games. Application software is designed to run on top of the operating system. It uses the resources provided by the computer system to perform its tasks.

These are just a few of the fundamental characteristics, functions, and features of each computer system element. Understanding each component is essential to ensure that the computer system can perform effectively and efficiently.

4. **Demonstrate the theories and nature of data representation for computers.**

Data representation is how information is encoded and stored in a computer's memory. Computers operate on a binary system, representing all information as 0s and 1s (Data Recovery Specialists, n.d.). The binary number system is the name given to this system.

The bit, which can be either a 0 or a 1, is a computer's most fundamental unit of information. Bits can be combined to form larger units of information, such as bytes, which are made up of 8 bits (Introduction to Computer Data Representation, n.d.).

Data can be represented in a computer in a variety of ways, including:

Binary: Only 0s and 1s are used to represent data.

Decimal: Base-10 numbers are used to represent data, which means that there are ten possible digits (0-9).

Hexadecimal: Base-16 numbers represent data, meaning there are 16 possible digits (0-9 and A-F).

ASCII: A standardised system of codes representing letters, numbers, and symbols is used to represent data.

Unicode: A more comprehensive system of codes that can represent characters from multiple languages and scripts is used to represent data.

The application and the type of data being stored determine how data is represented in a computer. Images and videos, for example, are represented in a different format than text documents or programme files.

Computer data representation generally entails converting information into a series of 0s and 1s that electronic circuits can store and process. This process necessitates meticulous attention to detail and a thorough understanding of computer architecture and data storage principles. Understanding the theories and nature of data representation is essential for computer professionals. It can help ensure that data is properly stored and processed by computer systems, and it can also help optimise the performance and efficiency of computer systems.

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