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CHAPTER 2: CONCEPTS OF DATA, INFORMATION, AND COMPUTER SYSTEMS IN THE DIGITAL ERA

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Abstract
This chapter presents a comprehensive introduction to the fundamental concepts of data, information, and computer systems, along with their role in modern information processing. It begins by defining data as raw facts and information as processed, meaningful output, followed by an exploration of different types of data processing methods, including manual, mechanical, and electronic processing. The chapter further discusses the importance, uses, and levels of information in organizational decision-making, including operational, tactical, and strategic information.
In addition, the chapter examines the characteristics and quality of information, highlighting key attributes such as accuracy, relevance, timeliness, and security. It also provides insights into electronic record keeping and compares electronic and manual systems. The evolution of computers through different generations is outlined, along with the fundamental components and characteristics of computer systems. Finally, the chapter explores real-world applications of computers across various domains such as education, business, healthcare, and home use, demonstrating their impact on modern society.

Keywords
Data, Information, Data Processing, Information Systems, Electronic Data Processing, Information Quality, Computer Systems, Computer Generations, Information Technology, Decision Making, Digital Systems

Data:

Data are the raw facts or figures which are processed to get the information.

Need of Data Processing

Data is processed to get the required results. Different operations may be performed on data. Therefore, data processing is defined as: "A sequence of operations on data to convert it into useful information is called data processing."

The important operations that can be performed on data are:

- Arithmetic and logical operations on data to get required results.

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- To send and receive data from one location to another.
- Classification of data.
- Arranging data into a specific order etc.

The data processing is divided into three categories or levels.

1. Manual Data Processing: In manual data processing, data is processed manually without using any machine or tool to get required result. In manual data processing, all the calculations and logical operations are manually performed on the data. Similarly, data is manually transferred from one place to another. This method of data processing is very slow and errors may occur in the output. In India, data is still processed manually in many small business firms as well as government offices & institutions.
2. Mechanical Data Processing: In mechanical data processing, data is processed by using different tools like calculators or other mechanical devices. This method of data processing is faster and more accurate than manual data processing.
3. Electronic Data Processing: It is the modern technique to process data. The data is processed through computer. Data and set of instructions are given to the computer as input and the computer automatically processes the data according to the given set of instructions. The computer is also known as electronic data processing machine. This method of processing data is very fast and accurate. Now-a-days, the data is processed and analyzed through computers. For example, the results of students are prepared through computer; in banks accounts of customers are processed through computers etc.

Information:

Information is the processed data. Data is entered into and stored in a computer. After processing (such as formatting and printing) output data become information. Means useful data is called Information.

Need of information:

- Information is needed to survive in the modern competitive world.
- Information is needed to create strong information systems and keep these systems up to date.
- Information is needed for organizational decision making.
- Most of the services sectors are depended on information including banking, financial organization, health care, entertainment, tourism and travel, education and numerous others.
- Strong growth of information services fuelled by increasing competition and reduced product life cycle.
- Need for sustainable development and quality life.
- Improvement in communication and transportation brought in by use of information processing.
- Use of information processing in reduction of energy consumption, reduction in pollution and a better ecological balance in future.
- Use of information processing in land record managements, legal delivery system, educational institutions, natural resource planning, customer relation management and so on.

The following list summarizes the five main uses and need of information by businesses and other organizations:

- Planning - At the planning stage, information is the most important ingredient in decision making. Information at planning stage includes that of business resources, assets, liabilities, plants and machineries, properties, suppliers, customers, competitors, market and market dynamics, fiscal policy changes of the Government, emerging technologies, etc.
- Recording - Business processing these days involves recording information about each transaction or event. This information collected, stored and updated regularly at the operational level.
- Controlling - A business need to set up an information filter, so that only filtered data is presented to the middle and top management. This ensures efficiency at the operational level and effectiveness at the tactical and strategic level.
- Measuring - A business measures its performance metrics by collecting and analyzing sales data, cost of manufacturing, and profit earned.
- Decision-making - MIS is primarily concerned with managerial decision-making, theory of organizational behavior, and underlying human behavior in organizational context. Decision-making information

includes the socio-economic impact of competition, globalization, democratization, and the effects of all these factors on an organizational structure.

Level of Information:

Information, as required at different levels can be classified as operational, tactical and strategic.

1. Operational information:

Operational information relates to the day-to-day operations of the organization and thus, is useful in exercising control over the operations that are repetitive in nature. Since such activities are controlled at lower levels of management, operational information is needed by the lower management.

For example, the information regarding the cash position on day-to-day basis is monitored and controlled at the lower levels of management. Similarly, in marketing function, daily and weekly sales information is used by lower level manager to monitor the performance of the sales force.

It may be noted that operational information pertains to activities that are easily measurable by specific standards. The operational information mainly relates to current and historical performance, and is based primarily on internal sources of data. The predictive element in operational information is quite low and if at all it is there, it has a short term horizon.

2. Tactical information:

Tactical information helps middle level managers allocating resources and establishing controls to implement the top level plans of the organization. For example, information regarding the alternative sources of funds and their uses in the short run, opportunities for deployment of surplus funds in short- term securities, etc. may be required at the middle levels of management.

The tactical information is generally predictive, focusing on short-term trends. It may be partly current and partly historical, and may come from internal as well as external sources.

3. Strategic information:

While the operational information is needed to find out how the given activity can be performed better, strategic information is needed for making choices among the business options.

The strategic information helps in identifying and evaluating these options so that a manager makes informed choices which are different from the competitors and the limitations of what the rivals are doing or planning to do. Such choices are made by leaders only.

Strategic information is used by managers to define goals and priorities, initiate new programs and develop policies for acquisition and use of corporate resources. For example, information regarding the long-term needs of funds for on-going and future projects of the company may be used by top level managers in taking decision regarding going public or approaching financial institutions for term loan.

Strategic information is predictive in nature, relies heavily on external sources of data, has a long-term perspective, and is mostly in summary form. It may sometimes include 'what if' scenarios. However, the strategic information is not only external information.

For long, it was believed that strategic information is basically information regarding the external environment. However, it is now well recognized that the internal factors are equally responsible for success or failures of strategies and thus, internal information is also required for strategic decision making.

Figure 1.2 represents the types of information required at different levels of managerial hierarchy.

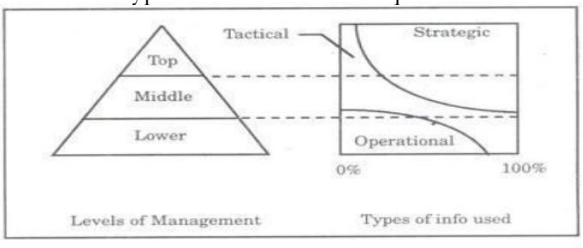


Fig. 1.2 Types of information and levels of management

It may be remembered that each type of information has its role to play in managerial effectiveness. Each type of information is needed with varying degree by the managers at all levels. Thus, a part of operational information may be used even by the chief executive officer of a company.

The difference lies in the proportion of each type of information in the total information needs of managers at different levels of managerial hierarchy.

Quality of information:

The meaning of information quality lies in how the information is perceived and used by its customer. Though absolute attributes are important, it is how those attributes are perceived, now and in the future, that defines information quality. Identifying quality information involves two stages: first, highlighting which attributes are important and second, determining how these attributes affect the customers in question. Quality information meets certain recognized criteria such as "accuracy", "timeliness", "relevance", and "understandability". Following are the majors of information quality:

1.Relevance:

The key component for information quality is whether the information addresses its customer's needs. The *relevance* of information reflects the degree to which it meets the real needs of clients. It is concerned with whether the available information sheds light on the issues that are important to users. Assessing relevance is subjective and depends upon the varying needs of users.

2.Accuracy:

The *accuracy* of statistical information is the degree to which the information correctly describes the phenomena it was designed to measure. It is usually characterized in terms of error in statistical estimates and is traditionally decomposed into bias (systematic error) and variance (random error) components. It may also be described in terms of the major sources of error that potentially cause inaccuracy (e.g., coverage, sampling, non response, response).

3.Timeliness:

Timely information is still current. Implicit in this definition is a dynamic process where new information arises to replace the old. Information has a cycle time which depends on how quickly new information can be processed and communicated to its customer.

4.Completeness

Incomplete information can lead its customer astray. An example of this is the old story of blind travelers encountering an elephant in the road with each, after examining a small section, coming to a different conclusion regarding the object's identity. However, complete information for one person may be incomplete for another. For example, the marketing vice president and the director of research and development for a pharmaceutical company may be both be interested in the clinical trials tests for a new drug, but each may require different levels of detail.

5.Coherence

Coherence is how well the information "hangs together" and it consistent with itself. Information can become incoherent through irrelevant details, confusing measures or ambiguous format which can confuse information customers and cause them to not receive or even reject the information's message. Although information can be genuinely incoherent, incoherent information usually indicates an error in accuracy or timeliness.

6.Format

Information format refers to how the information is presented to the customer. Two components of information format are its underlying form and its context for interpretation, which is sometimes referred to as its frame.

The appropriate format for information depends on the information's customer and the information's use. For example, an accountant may prefer twenty pages of numbers to a graphical summary, but may insist of using only multi-color pie charts for his presentation to the senior vice president of sales.

The context with which we view information also is important. For example, when a company benchmarks its performance against industry or functional world class leader, it seeks to give that information context. For years financial analysts have viewed information in context, witness the focus on stock price performance over time, a portfolio manager's performance relative to the S&P 500, or corporate performance versus that of the corporation's

industry.

7.Accessibility

Accessible information is information that can be obtained when needed. Accessibility depends on the customer and even the specific circumstances for that customer. For information quality to occur, timeliness and accessibility should complement each other. Timely information that is inaccessible or accessible information that is obsolete, cannot satisfy an information customer's needs.

Applications of information technology to customer services offer excellent examples of how firms can use quality in information accessibility to obtain competitive advantage witness 800 numbers for computer software and hardware firms, credit card providers and mutual funds.

8.Compatibility

To paraphrase a famous line, "no information is an island." Information quality lies not only in the quality of the information itself, but also in how it can be combined with other information and delivered to a customer. This often involves systems working together.

The proper information architecture enhances information quality by making the information suitable for enhanced uses. A quality architecture implies a dynamic structure that can grow with changing customer requirements. This is necessary when companies must leverage their information base to develop new products and services as well as optimize their production and management processes.

9.Security

Historically, information security has been a stepchild of the information technology revolution. Security often was either added on after information systems development was completed or ignored altogether. Two aspects of information security are protecting information from people (logical security) and protecting information from natural disasters (disaster recovery planning). Logical security relies on logical barriers such as passwords, data encryption and transaction authentication, along with human vigilance. Disaster recovery planning involves protecting information and ensuring appropriate back-up and alternate processing procedures are in place.

The topic of information security has become increasingly visible in recent years. Indeed breaches of information security are a potential Achilles heel for the entire information technology revolution because information that is not secure cannot be trusted, and will not be used to its fullest potential.

10.Validity

Information has validity when it can be verified as being true and satisfying appropriate standards related to other dimensions such as accuracy, timeliness, completeness and security. The most common form of verification is auditing information, either as an ongoing practice or as part of a special project. Auditing can uncover mistakes and is a accepted measure of information quality. An obvious example is the corporate financial statement, which to be credible must be audited by an independent party. However, just as quality cannot be inspected into manufactured products, quality cannot be audited into information products.

Validity is a resultant rather than a causal dimension of information quality. Though validity may be high, other crucial dimensions may be low and overall, the information may be of poor quality. Ultimately, optimizing the design and ongoing operation of the human and technological information system is the road to information quality.

Electronic record keeping

Advantages

- Helps you record business transactions, including income and expenses, payments to workers, and stock and asset details.
- Efficient way to keep financial records and requires less storage space.
- Provides the option of recording a sale when you raise an invoice, not when you receive a cash payment from a client.
- Easy to generate orders, invoices, debtor reports, financial statements, employee pay records, inventory reports.
- Automatically tallies amounts and provides reporting functions.
- Keeps up with the latest tax rates, tax laws and rulings.
- Many accounting programs have facilities to email invoices to clients, orders to suppliers, or BAS returns

to the Australian Taxation Office.
- Allows you to back up records and keep them in a safe place in case of fire or theft.

Manual record keeping

Advantages

- Less expensive to set up.
- Correcting entries may be easier with manual systems, as opposed to computerized ones that can leave complicated audit trails.
- The risk of corrupted data is much less.
- Data loss is less of a risk, particularly if records are stored in a fire-proof environment.
- Problems with duplicate copies of the same records are generally avoided.
- The process is simplified as you don't need to be familiar with how accounting software calculates and treats your information.

The Difference/ comparison between Electronic and Paper Documents

1. The magnitude of electronic data is way larger than paper documents

This point is obvious to the majority of observers. Today's typical disks are at several dozen gigabytes and these sizes grow constantly. A typical medium-size company will have PC's on the desks of most white-collar workers, company-related data, accounting and order information, personnel information, a potential for several databases and company servers, an email server, backup tapes, etc. Such a company will easily have several terabytes of information. Accordingly, such a company has over 2 million documents. Just one personal hard drive can contain 1.5 million pages of data, and one corporate backup tape can contain 4 million pages of data. Thus the magnitude of electronic data that needs to be handled in discovery is staggering. In most corporate civil lawsuits, several backup tapes, hard drives, and removable media are involved.

2. Variety of electronic documents is larger than paper documents

Paper documents are ledgers, personnel files, notes, memos, letters, articles, papers, pictures, etc. This variety exists also in electronic form. But then spreadsheets are way more complex than ledger, for example. They contain formulas, may contain charts, they can serve as databases, etc. In addition to all added information, e.g. charts, ability to view the actual computations involved, e.g. formulae, the electronic spreadsheet supports experimentation with what-if version the discoverer may want to investigate. Personal digital assistants, pocket PCs, palm devices or BlackBerry devices, are subject to electronic discovery. Many of these devices can be used to send and retrieve e-mails. Since an e-mail deleted from a network may still exist on an individual employee's PDA, parties may demand discovery of the contents of PDAs.

3.Electronic documents contains attributes lacking in paper documents

Computers maintain information about your documents, referred to as "metadata," such as: author's name, document creation date, date of it last access, etc. A hard copy of the document does not reveal metadata, although certain metadata items may be printed. Depending on what you do with the document after opening it on your computer screen, the actions taken may change the metadata collected about that document. Paper documents were never this complex.

4 Electronic documents are more efficient than paper documents

Paper documents are delivered by mail and stored locally in filing cabinet. For multiple users to access documents simultaneously one needs a set of documents per each accessing person. File cabinets are bulky and use up valuable office space. Paper documents are difficult to search, carry, copy, and modify. Paper documents are easily damaged, misfiled or misplaced. Electronic documents are delivered by networks, disks, flash memory and CD/DVD and are stored on a file system. Multiple users can read and review electronic document simultaneously. Computer file systems are getting smaller and contain more data every year. Personal file systems are physically smaller than a small cell phone; only very large companies need massive file systems that occupy a lot of real estate. It is almost too easy to search, carry, copy, and modify electronic documents. Electronic documents, in a well run operation, have copies and damage to a single copy causes extra work but no loss.

5 The structure of electronic documents may reach complexity absent from paper documents

A description of the structure of an object (i.e. document) identifies its component parts and the nature of the relationships between those parts. Describing documents (i.e. objects) this way points to the complexity of electronic documents.

The following list shows some aspects of the complexity of electronic documents.

- An electronic document may consist of subdocuments that do not even have to reside on
- the same computer.
- An electronic document may be written in HTML and displayed by a Web browser. Such paper documents don't even exist.
- An electronic document may have hyperlinks to other documents.
- An electronic document may have dynamic parts. This holds in an obvious way to Web pages that can include (and invisible to the reader) programs in languages such as javaScript and ASP, which run in the browser and the reader views only the results of these runs. It may also hold to text document or spreadsheets as a result of embedded executable fields, functions and macros.
- Electronic documents have much wider spectra than paper ones as they can include not only the classic, word-processed text but table databases or a part thereof as well as image, voice and video.

6 Electronic documents are more persistent and more difficult to destroy than paper documents

Paper documents are easy to destroy. Throwing away or shredding makes paper documents disappear. Deleting an electronic document eliminates only the ubiquitous accessible copy. The document, i.e. its data, still exists and in systems such as Windows and Mac OS, an accessible reference to deleted documents may be in the trash bin. Restoring a document in the trash bin, i.e. a deleted document, revives the document to its original glory. Even removing the document from the thrash bin does not erase the documents data off the disk. Once removed from the thrash bin, documents data areas on the disk go into a "fee list" that makes those areas available for future data creation needs. The free list contains all areas not currently allocated to active documents as well as to deleted documents still in the trash bin. How long will an area stay on the free list (thereby still containing the deleted documents data)? That is difficult to predict due the huge variability of factors such as: future demand for disk space, size of current and future files, the current availability of disk space, etc.

Even the complete deletion of a document, its trash bin instance and the allocation of the document's data area on the disk does not typically extinguishes the document altogether. Several practices create copies of documents and are only marginally affected by document deletion:

- Backups – most organizations and individuals create backup copies of documents as regular practice as precautionary actions. The backups are maintained independently of the document itself.
- Documents may be exchanged by email, access through web pages and manually handed electronic copies. Thus created copies continue to exist after the deletion of the original document.
- Even work on a simple text document is quite frequently preceded by creating a copy of the document being edited. Once again, such copies persist beyond the deleted document unless specifically deleted.

7 Electronic documents change faster, more frequently and easier than paper documents

Changes to an electronic document are fast and easy. The reason is obvious; all you need to do is make the change and save it. Changes to paper documents, however, require retyping the whole document. There are many other reasons to the difference in speed and frequency. We already said that documents may be dynamic. Web pages are made dynamic in order to ease change. For discovery, faster and frequent changes imply a need for a more meticulous and length monitoring of document discovery.

8 Electronic documents last longer than paper documents

Paper deteriorates with time; paper documents can be destroyed by flood and fire. Although these factors have their parallels in electronic documents, e.g. a flooded computer loses its data; typical backups of the documents practices maintain copies away from the "office." Paper documents may enjoy the same treatment, but the frequency, extent and usage of such backups is substantially smaller. Electronic document suffer from upgrades in technology. If one used a peculiar word processor, e.g. WordStar, to write a document ten years ago, today it will be difficult to find a tool to read that document. Same holds for spreadsheets, databases, etc. Again, most companies have practices that avoided such problem by evolving documents with time.

9 The redundancy in electronic documents is higher than in paper documents

- There are several levels of redundancy to electronic documents.
- Due to the type of recording used for electronic data, minor errors in a document can be corrected by computer tools. The tools rely on the redundancy of checksums and other devices
- Due to frequent changes in documents, individuals learn to save previous versions of the documents. Doing that generates redundancy of document versions.
- Emails, flash memories, CDs all proliferate documents and result in high redundancy
- Most companies and many individuals make backup of documents
- Tool that control versioning of files create built-in redundancy

10 An electronic data is more likely to be created by several individuals than a paper document

MS Word supports "Document Collaboration." Where this term implies: "new objects, properties, and methods of the Word 10.0 Object Library shown in this article allow you to change the display of revisions and comments, accept and reject revisions, and start and end a collaborative review cycle." Another tool, Workshare , is an add-on to Microsoft Word that manages collaboration on Word documents and integrates this activity with email and the organization's document repository tool. Collaborations on databases (e.g. people using a bank's ATMs update the bank's database), spreadsheets (e.g. BadBlue), and Web sites are commonly practiced. This dwarfs collaborations on paper documents possible. For discovery it implies that the author of a Word document may not be the only person involved in writing the document. One has to determine all the parties that collaborated on the document.

11 Electronic documents may be created by electronic means while paper documents are created by humans

Paper documents are always written by human beings. That is not necessarily the case with documents. We start with a simple, and rather common, example. The Quicken financial program will generate financial reports from a database of financial transactions.

12 Electronic discovery requires support of an infrastructure that paper discovery has never needed

The large volumes of data, its complexity and its variety of electronic documents have brought about many types of computer tools to help overcome the obvious difficulties.

Brief History of Development of computers:

The history of computers starts out about 2000 years ago in Babylonia (Mesopotamia), at the birth of the abacus, a wooden rack holding two horizontal wires with beads strung on them. We can divide the history in 5 generations:

The Five Generations of Computers:

1.First Generation (1940-1956) Vacuum Tubes:

The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. They were very expensive to operate and in addition to using a great deal of electricity, generated a lot of heat, which was often the cause of malfunctions.

First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time. Input was based on punched cards and paper tape, and output was displayed on printouts.

The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951.

2.Second Generation (1956-1963) Transistors:

Transistors replaced vacuum tubes and ushered in the second generation of computers. The transistor was invented in 1947 but did not see widespread use in computers until the late 1950s. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages,

which allowed programmers to specify instructions in words. High-level programming languages were also being developed at this time, such as early versions of COBOL and FORTRAN. These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

The first computers of this generation were developed for the atomic energy industry.

3.Third Generation (1964-1971) Integrated Circuits:

The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.

Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

4.Fourth Generation (1971-Present) Microprocessors:

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer—from the central processing unit and memory to input/output controls—on a single chip.

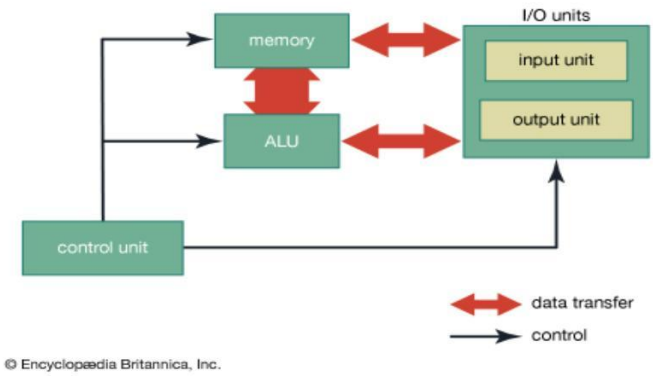
In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.

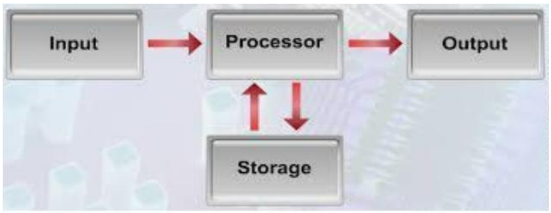
As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet. Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

5.Fifth Generation (Present and Beyond) Artificial Intelligence:

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

Computer system concept:





The computer is a system of hardware devices organized according to the following system functions:

1.Input. The input devices of a computer system include keyboards, touch screens, pens, electronic, optical scanners, and so on. They convert data into electronic machine-readable form for direct entry or through telecommunications links into a computer system.

2.Processing. The central processing unit (CPU) is the main processing component of a computer system. (In microcomputers, it is the main microprocessor.) hi particular, the arithmetic-logic unit, one of the CPU's major components, performs the arithmetic and logic functions required in computer processing.

3.Output. The output devices of a computer system include video display units, printers, audio response units, and so on. They convert electronic information produced by the computer system into human-intelligible form for presentation to end users.

4.Storage. The storage function of a computer system takes place in the computer's primary storage unit, or memory, and in secondary storage devices such as magnetic disk and tape units. These devices store data and program instructions needed for processing.IWC replica watches.

5.Control. The control unit of the CPU is the control component of a computer system. It interprets computer program instructions and transmits directions to the other components of the computer system.

Computer system characteristics:

The characteristics of computers that have made them so powerful and universally useful are speed, accuracy, diligence, versatility and storage capacity.

1.Speed: Computers work at an incredible speed. A powerful computer is capable of performing about 3-4 million simple instructions per second.

2. Accuracy: In addition to being fast, computers are also accurate. Errors that may occur can almost always be attributed to human error (inaccurate data, poorly designed system or faulty instructions/programs written by the programmer).

3. Diligence: Unlike human beings, computers are highly consistent. They do not suffer from human traits of boredom and tiredness resulting in lack of concentration. Computers, therefore, are better than human beings in performing voluminous and repetitive jobs.

4. Versatility: Computers are versatile machines and are capable of performing any task as long as it can be broken down into a series of logical steps. The presence of computers can be seen in almost every sphere – Railway/Air reservation, Banks, Hotels, Weather forecasting and many more.

5. Storage Capacity: Today's computers can store large volumes of data. A piece of information once recorded (or stored), in the computer, can never be forgotten and can be retrieved almost instantaneously.

Capabilities and Limitations of a Computer

Computers have become an essential part of modern life and are used in homes, schools, hospitals, banks, offices, and many other environments. They assist humans in performing a wide variety of tasks efficiently and accurately. Due to their versatility and power, people rely heavily on computers for work, communication, entertainment, and data storage. This widespread use is possible because computers possess several important capabilities.

Capabilities of a Computer

- One of the most significant features of a computer is its high processing speed. A computer can perform millions of calculations within a fraction of a second, making it extremely efficient for handling large volumes of data.
- Another important capability is accuracy. When provided with correct data and instructions, computers

can produce highly precise results. This is why they are widely used in scientific research, engineering, and financial systems.

- Computers are also capable of storing vast amounts of data. Modern storage devices allow users to save and retrieve information easily whenever required. This makes computers highly useful for maintaining records and documents.
- In addition, computers allow users to retrieve and modify previously stored work. Users can edit documents, duplicate files, and restore earlier versions, making work management convenient and flexible.
- Computers are also known for their automation. Once a task is programmed, a computer can perform it automatically without requiring constant human intervention.
- Another advantage is their ability to perform multiple tasks simultaneously. Users can run different programs at the same time, increasing productivity and efficiency.
- Finally, computers can be upgraded and improved. Hardware components and software can be replaced or enhanced, allowing computers to adapt to new technologies and requirements.

Limitations of a Computer

- Despite their many advantages, computers have certain limitations. A computer can only perform tasks based on the instructions provided to it. It cannot think independently or make decisions beyond its programming.
- Computers also cannot generate information on their own. They depend entirely on input data and instructions given by users. Without proper input, they cannot produce meaningful output.
- Another limitation is that computers cannot distinguish between correct and incorrect data. If incorrect data is entered, the output will also be incorrect. This concept is often referred to as "Garbage In, Garbage Out" (GIGO).
- Additionally, computers cannot correct wrong instructions automatically. If an error exists in a program or command, the computer will not be able to fix it and may stop functioning until the issue is resolved by a user.

Applications of Computers in various fields(in general and pharmacy):

Computers are used in so many fields in our daily life. From Engineers to Doctors, Students, Teachers, and Government Organization they all use computers to perform specific tasks, for entertainment or just to finish office work. Computers have made our life easier. With greater precision and accuracy and less time taking computers can do a lot in short time while that task can take a lot of time while doing manually. Computers have taken industries and businesses to a whole new level. They are used at Home for work and entertainment purposes, at Office, in hospitals, in government organizations. Following are some fields of the uses of computers.

A). Uses of Computer at Home:

Computer can be used at home in the following ways.

1.Home Budget:

Computer can be used to manage Home Budget. You can easily calculate your expenses and income. You can list all expenses in one column and income in another column. Then you can apply any calculation on these columns to plan your home budget. There are also specialize software that can manage your income and expenses and generate some cool reports.

2.Computer Games:

An important use of computers at home is playing games. Different types of games are available. These games are a source of entertainment and recreation. Many games are available that are specially developed to improve your mental capability and thinking power.

3.Working from Home:

People can manage the office work at home. The owner of a company can check the work of the employees from home. He can control his office while sitting at home.

4.Entertainment:

People can find entertainment on the internet. They can watch movies, listen to songs, and watch videos download different stuff. They can also watch live matches on the internet.

5.Information:

People can find any type of information on the internet. Educational and informative websites are available to download books, tutorials etc. to improve their knowledge and learn new things.

6.Chatting & Social Media:

People can chat with friends and family on the internet using different software like Skype etc. One can interact with friends over social media websites like Face book, Twitter & Google Plus. They can also share photos and videos with friends.

B).Uses of Computers in Education:

1.CBT(Computer based teaching): are different programs that are supplied on CD-ROM. These programs include text, graphics and sound. Audio and Video lectures are recorded on the CDs. CBT is a low cost solution for educating people. You can train a large number of people easily.

Benefits of CBT:

Some benefits of CBT are as follows:

1. The students can learn new skills at their own pace. They can easily acquire knowledge in any available time of their own choice.
2. Training time can be reduced.
3. Training materials are interactive and easy to learn. It encourages students to learn the topic.
4. Planning and timing problems are reduced or eliminated.
5. The skills can be taught at any time and at any place.
6. It is very cost effective way to train a large number of students.
7. Training videos and audios are available at affordable prices.

2.Computer Aided Learning (CAL):

Computer aided learning is the process of using information technology to help teaching and enhance the learning process. The use of computer can reduce the time that is spent on preparing teaching material. It can also reduce the administrative load of teaching and research. The use of multimedia projector and PowerPoint presentations has improved the quality of teaching. It has also helped the learning process.

3.Distance Learning:

Distance learning is a new learning methodology. Computer plays the key role in this kind of learning. Many institutes are providing distance learning programs. The student does not need to come to the institute. The institute provides the reading material and the student attends virtual classroom. In virtual classroom, the teacher delivers lecture at his own workplace. The student can attend the lecture at home by connecting to a network. The student can also ask questions to the teacher.

4.Online Examination:

The trend of online examination is becoming popular. Different examination like GRE, GMAT and SAT are conducted online all over the world. The questions are marked by computer. It minimizes the chance of mistakes. It also enables to announce the result in time.

C). Uses of Computers in Business:

The use of computer technology in business provides many facilities. Businessmen are using computers to interact with their customers anywhere in the world. Many business tasks are performed more quickly and efficiently. Computers also help them to reduce the overall cost of their business. Computer can be used in business in the following ways.

1.Marketing:

An organization can use computers for marketing their products. Marketing applications provide information about the products to customers. Computer is also used to manage distribution system, advertising and selling activities. It can also be used in deciding pricing strategies. Companies can know more about their customers and their needs and requirements etc.

2.Stock Exchange:

Stock Exchange is the most important place for businessmen. Many stock exchanges use computers to conduct bids. The stockbrokers perform all trading activities electronically. They connect with the computer where brokers match the buyers with sellers. It reduces cost as no paper or special building is required to conduct these activities.

D). Uses of computers in Pharmacy/Medical Field:

1.Hospital Management System:

Specialized hospital management software's are used to automate the day to day procedures and operations at hospitals. These tasks may be online appointments, payroll admittance and discharge records etc.

2.Patient History:

Hospital management systems can store data about patients. Computers are used to store data about patients, their diseases & symptoms, the medicines that are prescribed.

3.Patients Monitoring:

Monitoring systems are installed in medical wards and Intensive care units to monitoring patients continuously. These systems can monitor pulse, blood pressure and body temperature and can alert medical staff about any serious situations.

4.Life Support Systems:

Specialized devices are used to help impaired patients like hearing aids.

5.Diagnosis Purpose:

A variety of software's are used to investigate symptoms and prescribed medication accordingly. Sophisticated systems are used for tests like CT scan, ECG, and other medical tests.

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