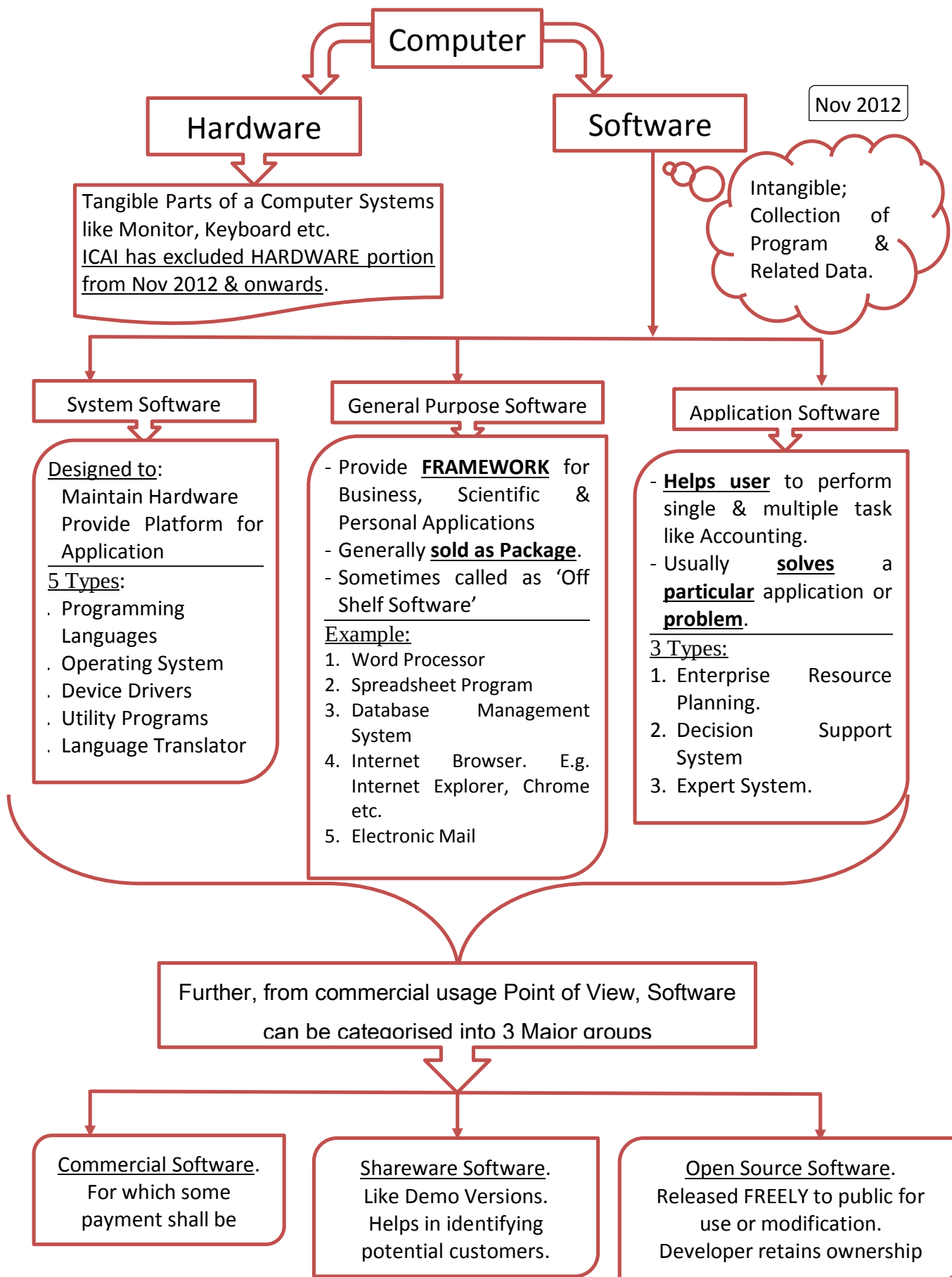


CHAPTER 1 – INTRODUCTION TO COMPUTERS



1. WHAT IS SOFTWARE???

1. A set of programs, which are combined together to perform specific task is known as software.
2. IT is intangible.
3. Guides computer at every step during execution of a job/work.
4. There are basically three types of software: Systems software, applications software and general-purpose software.

2. GENERAL PURPOSE SOFTWARE

1. A software which usually provides the most common or general applications to any user is called General-purpose Software.
2. It addresses problems that are not unique to any organization.
3. Most general-purpose software are sold as packages and accompanied by user-oriented documentation such as reference manuals, keyboard templates, and so on.
4. For example, an accountant can use spreadsheet software to create a template for preparing a balance sheet of a company.

Some popular types of general purpose software are**2.1 Word Processor:**

1. Word processor is a computer software used for the composition, editing, formatting, and printing of documents consisting of text, images and tables together.
2. Most modern word processors Software like Microsoft Word have a graphical user interface making them very easy to use.

2.2 Spreadsheet Program:

1. A spreadsheet is a large rectangular table (or grid) of information, often of quantitative or financial nature.
2. It generally simulate accounting & financial information on the worksheet.
3. It also provides various mathematical, statistical, financial functions, etc., to support calculations and analysis.
4. Apart from it provides a very powerful feature, i.e. charts or charting facility, where data can be presented graphically as Bar Charts, Pie Charts, etc.
5. Some popular spreadsheet programs are Lotus 1-2-3, Microsoft Excel, etc.
6. Spreadsheets are frequently used for financial information because of their ability to re-calculate the entire sheet automatically after a change to a single cell is made

2.3 Database Management System:

1. A database management system (DBMS) is a software designed to manage a large collection of records.
2. Performs various operations on the data such as arranging data in ascending or descending order, and so on.
3. Typical examples of DBMS use include accounting, human resources and customer support systems.

2.4 Internet Browser:

1. An Internet Browser or a web browser is a software which enables opening any web page with all its contents like text, images, and other information.
2. Such a web page may be located at a website on the World Wide Web or a network.
3. Text and images on a web page can contain links called hyperlinks to other web pages on the same or different websites.
4. Web browsers allow a user to quickly and easily access information provided on many web pages on many websites by moving or browsing through these links.
5. Web browsers available for personal computers include Microsoft Internet Explorer, Mozilla Firefox, Apple Safari, Netscape, etc.

2.5 Electronic mail software:

1. E-mail software is a software for composing, sending, storing, and receiving messages over the internet.
2. It uses specific protocols like *Simple Mail Transfer Protocol (SMTP) & Post Office Protocol V3 (POP3)* for *sending & receiving emails*.
3. Popular example of the e-mail software available for personal computers is Microsoft Outlook.

3. APPLICATION SOFTWARE

1. A software which is designed to process a particular application that is usually unique to that organisation is called an Application Software.
2. Usually different organisations require different programs as their procedures, reports, etc. differ, hence in such cases it becomes difficult to write standardised programs like general purpose software.
3. However, tailor-made application software can be written by software houses on modular design to cater to the needs of different users.
4. Examples of such programs are Payroll, Accounting, Inventory Control, etc.

Some popular Application Software are as follows:

3.1 Enterprise Resource Planning (ERP)

PM

1. ERP is the latest, comprehensive, integrated, readymade and high-end software meant for business organisations that integrates various business processes and improves information flows in the company.
2. It aims to effectively utilise the resources of an organisation, namely men, material, money and machine through better information.
3. Enterprise Resource Planning software offers an integrated software solution to all the functions of an organisation. In a rapidly changing environment, it is impossible to create and maintain a custom-designed software package which will cater to all their requirements and be up-to-date.
4. ERP aims at one database, one application and one user interface for the entire enterprise.
5. It takes information from every function and that assists employees and managers to plan, monitor and control the entire business. It is a global software and is hence suitable for MNCs.

What an ERP do (Benefits of ERP)

- An Enterprise Resource Planning System is a fully integrated business management system covering all functional areas of an enterprise like Production, Finance, Accounting, Marketing and Human Resources.
- It organises and integrates operation processes and information flows to make optimum use of resources such as men, material, money and machine.
- It can enhance an organisation's ability to accurately schedule production, fully utilise capacity, reduce inventory and meet promised dispatch dates for customers.
- Replaces many independent software and provides additional benefits that range from standardisation and lower maintenance (one system instead of two or more), easier and greater reporting capabilities (as all data is typically kept in one database).
- Examples are SAP R/3, Oracle Applications, etc.

3.2 Decision Support Systems (DSS)

Nov 2009

- A DSS can be defined as a system that provides tools to managers to assist them in solving semi structured & unstructured problems i.e. non-routine problems.
- DSS supports the human decision-making process, rather than providing a means to replace it.
- These software provide analysis and flexible reports for unstructured and semi-structured problems of users, unlike earlier systems which can provide only defined and rigid reports.
- DSS use graphics capabilities and latest programming languages.

Nov 2009

Characteristics of DSS:

- Support Semi-structured/unstructured Decision Making** – Structured decisions are those that are made from a given set of inputs. Unstructured decisions and semi-structured decisions are decisions for which information obtained from a computer system is only a portion of the total knowledge needed to make the decision. The DSS is particularly well adapted to help with semi-structured / unstructured decisions.
- Ease of Learning & Use** – Since DSS are often built and operated by users rather than by computer professionals. Therefore, the accompanying tools/models should be easy to learn & use, like (i) GUIs, (ii) Tables, (iii) Graphs, (iv) Non-procedural 4GL, (v) Natural English, (vi) 'Easy read' documentation.
- Ability to adapt to changing needs** – Semi-structured/unstructured decisions often do not conform to a predefined set of decisions-making rules. Because of this, their DSS must provide for enough flexible to enable users to model their own information needs.

Components of Decision Support System

May 2012

- Users** The user of a DSS is a manager with an unstructured or semi-structured problem to solve. The manager may be at any level of authority in the organisation (either top management or operating management).
Users do not need a computer background to use a decision support system for problem solving.

2. Database	DSS includes one or more databases. The users may themselves construct the databases. These databases contain both routine and non-routine data from both internal and external sources.
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ITSM no more a 'Theory Subject': Learn & Understand ITSM in 'PRACTICAL WAY'

3. Planning languages	The planning language is a set of interactive commands in a DSS which facilitates the user to maintain a dialogue with the model base. DSS uses the following two types of planning languages: <u>General-purpose planning languages</u> allow users to perform many routine tasks like retrieving data from a database or performing statistical analyses. For example, commands and formulae in electronic spreadsheets like MS-Excel. <u>Special-purpose planning languages</u> are more limited to perform specific tasks, like mathematical, financial or statistical analysis, e.g. Statistical software like SAS, SPSS and Minitab.
4. Model base	The Model Base is the brain of the DSS because it performs data manipulations and computations from the data provided to it by the user and the database. There are many types of model bases, most of them are custom-developed models that do mathematical functions like cross tabulation, regression analysis, time series analysis, linear programming and financial computations.

Examples of DSS in Accounting System

A) Cost Accounting System

- ✓ Decision Support Systems can accumulate product costs to calculate total costs per unit of production or service.
- ✓ A variety of decision support system applications in productivity, cost accounting, staff scheduling, etc., can be combined effectively to improve its management decision making.

B) Capital Budgeting System

- ✓ Using DSS, accountants, managers and engineers can evaluate several investment alternatives at a time.
- ✓ Decision makers supplement the analytical techniques (like net present value and internal rate of return) with decision support tools.
- ✓ The DSS tools adopt the benefits of new technology, not considered in an old strict financial analysis.

C) Budget Variance Analysis System

- ✓ Budgeting analysis enables cost control and evaluation of managerial performance.
- ✓ A computerised DSS can be used to generate monthly variance reports.
- ✓ The DSS helps to create and control budgets for the use of cost centre managers reporting to them.

D) General Decision Support System (GDSS)

- ✓ Some planning languages used in DSS are general purpose and have the ability to analyse many different types of problems.
- ✓ The user inputs data and answers questions about a specific problem domain to make use of this type of general decision support system.
- ✓ The user works interactively with the computer to develop a hierarchical model of the decision problem.
- ✓ The DSS then asks the user to compare decision variables with each other.

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3.3 Expert system

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1. An expert system (ES) is a computerised information system that allows non-experts to make decisions comparable to those of an expert.
2. Expert systems are used for complex tasks that require experience and specialised knowledge in narrow, specific subject areas.

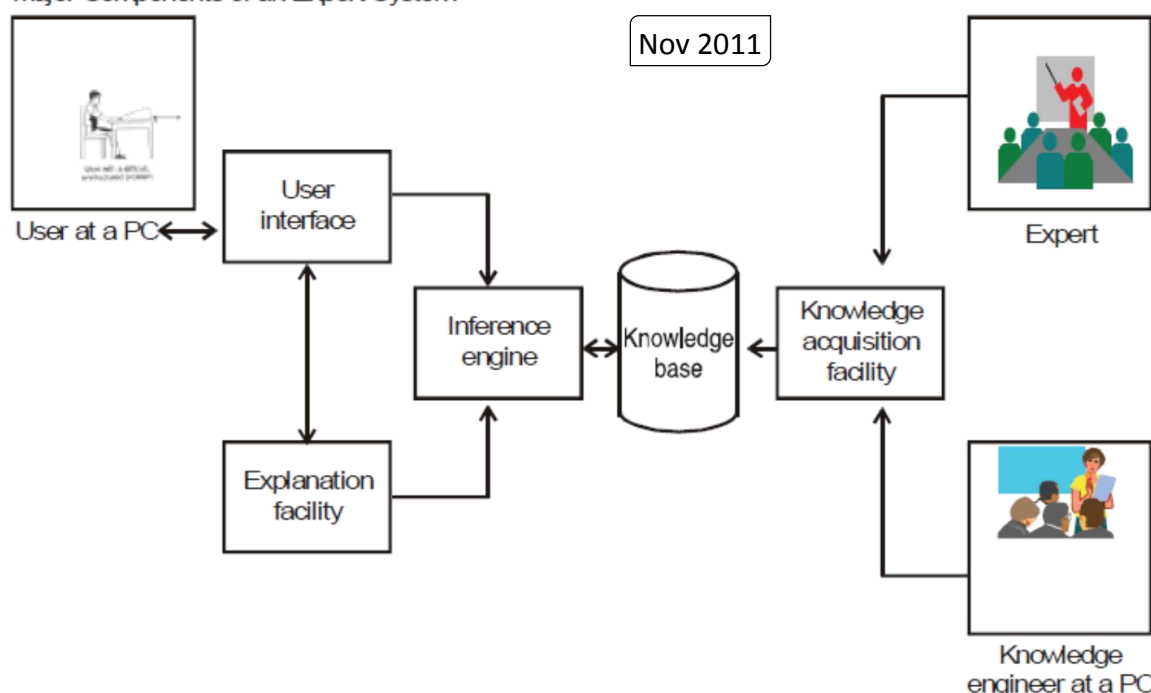
Components of Expert System

PM

Nov 2012

1. Knowledge base	A knowledge base is the computer equivalent of all the knowledge and insight that an expert or a group of experts develop through years of experience in their field.
2. Inference engine	This program contains the logic and reasoning mechanisms and uses data obtained from both the knowledge base and the user to make associations and inferences, form its conclusions, and recommend a course of action.
3. User interface	This component of an expert system program allows the user to communicate with the other components of an expert system
4. Explanation facility	This facility provides the user with an explanation of the logic that the ES used, to arrive at its conclusion.
5. Knowledge acquisition facility	This component of an expert system is responsible for extracting an individual's expertise and entering it into the knowledge base.

Major Components of an Expert System



Expert systems offer the following benefits (Advantage):

- ✓ They provide a cost-effective alternative to human experts.
- ✓ They can prove to be better than a single expert because their knowledge is representative of numerous experts.
- ✓ They are faster and more consistent and do not get distracted or stressed out.
- ✓ They produce better-quality decisions.
- ✓ They preserve the expertise of an expert leaving the organisation.

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Disadvantages of Expert System

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- ✓ Development can be costly and time-consuming. Some large systems required upto 15 years and millions of dollars to develop.
- ✓ It can be difficult to obtain knowledge from experts who have difficulty specifying exactly how they make decisions.
- ✓ Designers have not been able to program what humans consider common sense into current systems. Consequently, rule-based systems break down when presented with situations they are not programmed to handle.
- ✓ Until recently, developers encountered skepticism from businesses due to the poor quality of the early expert systems and the high expectations of users.

Scepticism =
अविश्वास

Artificial Intelligence

Artificial Intelligence (AI) used in expert system, a term coined by John McCarthy in 1956, is defined as “the science and engineering of making intelligent machines.” It is the intelligence of machines and the branch of computer science which aims to create it. A facial recognition system is an example of artificial intelligence. AI assumes that being the property of human beings, intelligence can be so precisely described that it can be simulated by a machine. AI research is a highly technical and specialised field in computer today. The central problems of AI include such traits as reasoning, knowledge, planning, learning, communication and perception which are uniquely found in humans.

AI is based on many concepts such as neural networks, natural language, etc. A neural network is an interconnected group of nodes, akin to the vast network of neurons in the human brain.

Natural language (e.g. lisp, prolong, etc.) on the other hand, gives machines the ability to read and understand the languages that the human beings speak.

Today, artificial intelligence is been used in a wide range of fields including expert systems, medical diagnosis, stock trading, robot control, scientific discovery, video games, toys and Web search engines.

4. SYSTEM SOFTWARE

1. System software is computer software designed to operate the computer hardware and to provide and maintain a platform for running application software.
2. Manages the basic functioning of hardware and software components of any computer system.
3. Without system software, application software cannot run.
4. Computer manufactures build and supply system software with the computer system as these are complex and cannot be developed in-house.

It includes the following:

❖ Programming languages.	❖ Operating systems.
❖ Device Drivers.	❖ Utility programs.
❖ Language translators.	

4.1 Programming Languages

1. Computer languages which are used in writing computer programs are called programming languages.
2. Programming Languages are vocabulary and set of grammatical rules for instructing a computer to perform specific tasks.
3. Like English language, programming language has a unique set of keywords (words that it understands) and a special syntax.
4. We have a large variety of computer languages to suit a variety of purposes. For instance, the languages for commercial programming differ from the languages for internet applications.

Machine Language or I-generation Language	1. It is a computer programming language which uses machine codes which are understood by a particular computer technology only. 2. No translation is required before execution of programs, although these are difficult to use and learn. 3. Such languages use binary code system, i.e. zeros and ones, which is the language of computers. 4. It is also known as low-level language.
Assembler Language or II-generation Language	1. It is a computer programming language which uses Mnemonic codes i.e. symbols for programming, that is why it is also known as symbolic language. 2. After learning the complicated I-generation machine languages the computer scientists decided to make programming simpler. Hence they coined symbols instead of machine codes. 3. However it increased one step in programming process, i.e. before execution of program, translation became essential. 4. In case of II-generation programs it is carried out using a translator called the Assembler. 5. However programming is still difficult as large number of statements is required to be learned and written symbolically.
Compiler Language (High-level language) or III-generation Language or Procedural language	1. It is a computer programming language which employs plain English and Mathematical statements for programming. 2. It is hence the easiest language to learn and use. 3. Based on application, there are many different high-level languages, e.g. COBOL for business purposes, BASIC for general purposes and FORTRAN for science applications. 4. The programs written with these languages are easily understandable by humans but can be understood by computer only after translation through compiler/interpreter. 5. The programs written with these languages usually require more space and time for processing than with earlier generations. “Need to tell computer what to do & How to Do”

Fourth generation Language (4 GL)	1. It is a computer programming language which requires very little to be written by programmers as it consists of several readymade tools which convert any design or logic into program segments. 2. Segments here mean input screens, program menus, reports, etc. It ultimately leads to a great saving in terms of cost, time and efforts. 3. Further, as programs are written automatically using the fourth generation programming tools hence contain very little number of errors (called bugs). 4. It can be of two major types: a. Production-oriented 4 GL: These 4 GL tools are designed primarily for computer professionals to create information systems and programs to meet various types of needs of users. A very popular language under this category is Visual Basic. b. User-oriented 4 GL: These 4 GL tools are designed for end users only. The needs of end users are not of creating programs but using them. Hence, user needs 4 GLs to query a data base and to create small personal program. A very popular language under this category is SQL (Structured Query Language). “Need to tell computer what to do only”
Object oriented Languages and Programming Nov 2010	1. OOP is the latest programming tool that defines readymade and re-usable programs as classes which can be used anywhere in program segments developed by programmer as Objects, thus facilitates saving in cost, time, debugging, etc. For example, C++, Java, etc. These tools are easy to learn for programmers and reduce the development costs and time involved in application development. 2. OOP are more reliable and contain fewer errors, since the <u>modules</u> being used have already been extensively tested.

Modularity

Modularity in programming or Modular programming refers to a programming technique in which a large program is first divided into several small parts called modules, then each module is programmed independently and finally all modules are integrated. The advantages of modular programming are:

- ✓ Designing and developing smaller programs is far easier.
- ✓
- ✓ Any changes in a large program, which are bound to occur now and then, affect only one or a few modules which can be modified at a much lower cost than would have been the case for reprogramming in entirety.

Difference between 3GL & 4GL

May

Third-Generation Languages (3GLs)	Fourth-Generation Languages (4GLs)
❖ Intended for use by professional programmer	❖ May be used by a end user as well as a professional programmer
❖ Require specification of how to perform the task	❖ Require specification of what task to perform (system determines how to perform the task)
❖ Require that all alternatives be specified	❖ Have default alternatives built in; end user need not specify these alternatives
❖ Require large number of procedural instructions	❖ Require far fewer instructions (less than one-tenth in most cases)
❖ Code may be difficult to read, understand and maintain	❖ Code is easy to understand and maintain because of English-like commands
❖ Language developed originally for batch operation	❖ Language developed primarily for on-line use
❖ Can be difficult to learn	❖ Many features can be learned quickly
❖ Difficult to debug	❖ Errors easier to locate because of shorter programs, more structured

4.2 Operating or (Executive) Systems

1. An Operating System (OS) is system software that is used to manage all the hardware and application software resources of a computer.
2. Provide an interface to user for communicating with the computer.
3. An operating system also has a vital role to play in security. Its job includes preventing unauthorized users from accessing the computer system.
4. It has two goals:
 - a. Resource allocator
 - b. Control Program
5. Common example of OS for PCs is MS-Windows.
6. **It may be MULTI-TASKING OR SINGLE TASKING** → On old Single Tasking systems, only work can be performed at a time whereas in Multi-Tasking system, 2 or more programs can be run simultaneously like working on MS-Word and playing music at the same time.
7. It can be 32(x86) or 64(x64) bit.

There are **six basic functions** that an operating system can perform:

May 2013

Nov 2010

- 1) ***Schedule Jobs***: They can determine the sequence in which jobs are executed, using priorities established.
- 2) ***Manage Hardware and Software Resources***: They can first allow the user's application program to be executed by loading it into primary storage and then allows the various hardware units to perform as specified by the application.
- 3) ***Maintain System Security***: They may require users to enter a password - a group of characters that identifies users as being authorised to have access to the system.
- 4) ***Enable Multiple User Resource Sharing***: They can handle the scheduling and execution of the application programs for many users at the same time, a feature called multiprogramming.
- 5) ***Handle Interrupts***: An interrupt is a technique used by the operating system to temporarily suspend the processing of one program in order to allow another program to be executed.

- 6) **Maintain Usage Records:** They can keep track of the amount of time used by each user for each system unit - the CPU, secondary storage, and input and output devices. Such information is usually maintained for the purpose of charging users' departments for their use of the organization's computing resources.

Examples of Operating System

In ICAI study material various Operating Systems have been discussed but I have discussed only Windows 7 here.

Microsoft Windows 7

1. Latest operating system from Microsoft [However, Windows 8 is scheduled to be released to general public on October 26, 2012]
2. It provides multi-touch support.
3. Includes many network & security utility like Windows Defender.
4. Better systems performance through automatic drive defragmentation etc.
5. Runs on both x86 as well as x86-64 processors.
6. Provided stable multi-tasking environment.
7. Backward compatible with programs based on earlier version of Windows.
8. Some other general features
 - a. Based on GUI
 - b. User friendliness
 - c. Multi-tasking

Features of Operating System

The main features of these systems is networking capabilities, high security and various interleaving techniques to support multiple simultaneous users discussed below:

1. **Interleaving** -- It refers to supporting many users or programs at the same time using techniques like multi-programming, multi-processing, multi-tasking and so on.
2. **Multiprogramming** PM
 - a. It refers to execution of **two or more programs concurrently using a time-slice approach** to for scheduling all the jobs a computer or its **CPU (hardware)** has to process at a time.
 - b. It may be noted that the CPU cannot simultaneously execute instructions from two or more programs. However, it can execute instructions from one program, then from a second program, then from the first program again, and so on using special signals called interrupts and several memory elements called buffers.
 - c. This type of processing is referred to as 'concurrent execution' or 'interleaved execution'.
 - d. **Buffering** enables the processor to execute another instruction while input or output is taking place rather than being idle while transfer was completed.
 - e. In a system of multiprogramming, storage is allocated for each program. The areas of primary storage allocated for individual programs are called "partitions".

3. Multi-Threading

- This technique is used to execute any **application** effectively.
- In this technique a program execution is performed & controlled in multiple process and each process is independently executed by a Thread.
- Example – A web application used as a Single Thread Application then it can serve only a single client for the requested task. But if it is used as multi-threaded application then it can start a separate thread for each client request and can serve many clients simultaneously.
- This technique helps to achieve the efficient use of resources.
- It also helps to increase the responsiveness of application to its clients i.e. application serves all the clients together.

4. Multi-Tasking

May 2010

- It refers to the **Operating System's** capability to execute two or more of a single user's tasks concurrently.
- This is often accomplished through foreground/ background processing where several task can be done with the help of single operating system at the same time.

5. Virtual Memory

Nov 2010

- The word Virtual means “not in actual fact”.
- Hence virtual storage means primary memory that does not in actual fact exist.
- In case of large programs or files where one needs large RAM which may not be available, some space on hard disk is allocated to use as RAM which is called Virtual Memory.
- So it is a secondary memory used as primary.
- IT breaks program/data required for processing into multiple pages. Then operating systems loads required pages into RAM. When the required program/data is not found in RAM, operating systems overwrites pages from Hard Disk into RAM. Thus, this memory is also known as ‘Page Memory’.

6. Multi-processing

PM

- Multi-processing refers to a processing approach in which **two or more independent CPUs are linked together** in a coordinated system.
- In such a system, instructions from different and independent more CPUs may be simultaneously executing different instructions from the same program.
- Multi-processor systems are often used in airline, hotel reservation systems and credit card verification.
- Since several machines can work as a team and operate in parallel, jobs can be processed much more rapidly than a single machine.

7. Time-Sharing

- Time sharing is a concurrent or simultaneously sharing of computing resources.
- It is used by means of multi-programming & multi-tasking.
- In this processing time is divided into small slots called ‘Time-Slice’ and kept in a special area called ‘Ready Queue’.

- d. When a process has some input or output requirements, it is shifted from this area.
- e. Whenever the time slice becomes over, the processor looks for the next ready process for processing and starts its processing.

The below given features are not given in ICAI Study Material but are important so discussed.

8. Overlaying

- a. If any program is large, then the programmer has to divide the program into segments in such a way that, at a time, one segment resides in the primary storage and the remaining segments in the secondary storage.
- b. After the first segment of the program, which is in the primary storage, is complete the other segments from the secondary storage are written into the primary storage. This is known as overlaying.

9. Overlapped Processing and Buffer Storage

- a. The CPU processing speed is much higher than those of the input peripherals.
- b. Hence the computers perform reading, processing and writing in an overlapped fashion by means of buffers which are high speed storage elements.
- c. The buffers are connected to the CPU by means of channels which received appropriate signals from the CPU and then proceed to operate independently and without supervision to bring in data and write information while the CPU is engaged in calculations.
- d. **Buffer**: A buffer is a small high-speed storage element that plays an important role in overlapping input processing and output operations. Buffers may be located in peripheral devices (such as disk drive, tape drive and printer etc.) or they may be reserved sections of CPU primary storage. Data from input devices is stored into the input buffer under the control of a channel. The input buffer can accept data at a slow speed and transmit it to the CPU at electronic speed. Further, it accepts data from the CPU at electronic speed and releases it at a slower speed to the output buffer to match the operating speed of output devices.

10. User interface

User interface basically refers to the system of interaction or communication between the user and the computer. There have been broadly two user interfaces for PCs:

- ✓ Character User Interface (CUI) and
 - ✓ Graphical User Interface (GUI).
- a. **CUI** -- In the earlier systems, computer users used to interact with computer through commands, which were to be typed through keyboard. As much of character typing was involved in it, this interface was known as character user interface.
 - b. **GUI** -- Over the time it was realised that remembering commands and then typing them was difficult, as most people (non-programming users, e.g., clerks, operators, etc.) were finding it very difficult to do. Thus a new interface was originated which emphasised more upon knowing 'what' is required – by one or more clicks rather than typing of the command. This

interface was more graphics oriented and was known as Graphical User Interface (GUI).

GUI (Graphical User Interface) is an interface which emphasises upon graphic entities, which represents system resources and action through graphics and interacts with user through these graphic entities.

Common features of GUI include:

- (a) User-input devices are used, such as a pointing device, which is typically a mouse.
- (b) WYSIWYG (What You See is What You Get) approach.
- (c) Proper and efficient feedback and dialog with the user.
- (d) Well organised, beautiful and consistent visual effect (screens, etc.).

4.3 Device Drivers

1. Small files that act as an interface between Hardware and an Operating System.
2. Helps operating system to recognise the device and handle them effectively & efficiently.
3. Windows OS generally include drivers for many devices like keyboard, mouse etc. common hardware.
4. However, hardware those are manufactured later might require, drivers to be installed before using such hardware.

4.4 Language Translator

Nov 2011

1. A language translator is a system software which converts a program written in one language into the other.
2. For instance, programs written in III-generation high-level languages are understandable by programmers since these are based on English, but not to a computer, as computers understand only low level machine language which employs binary codes, i.e. zeros (0) and ones (1).
3. Hence after developing a program in III-generation language it is translated before execution into I-generation code using a language translator.
4. The original program is called the source code and the translated one, the object code. The three most widely used types of language translator are:

Compiler	A compiler is a language translator which translates one entire source program written in high-level III-language into machine language before the program is executed. Languages like COBOL, FORTRAN and Pascal use a `compiler.
Interpreter	An interpreter is a language translator which translates the source program written in a high-level language to machine-level language but only one line at a time as they are being run. As each statement is translated into machine language just before it is executed, no object module is ever produced. Languages like BASIC use an Interpreter.
Assemblers	Assemblers are the programs used exclusively for translating an assembly or II-generation language program into machine or I-generation language.

Compiler vs. Interpreter

Compiler	Interpreter
Compiler creates a list of errors without having to rectify them first.	Interpreter reports each and every error one by one as the program does not work unless such mistakes are rectified. Hence translation with interpreter is line by line and much slower.
With compiler, the whole program is translated in advance and each statement is not required to be translated at run time, the program runs faster.	With interpreter, each statement is required to be translated at run time so the program is should be slower.
With a compiler, a correct object code is created before executing the programs.	With an interpreter each statement is translated at run time, so no object code is created.

Some other points:

1. The program submitted for compilation is called a source program or module)
2. The compiled program into machine language, is called an object program or module
3. Linkage editor binds the object module of a program to object modules of other programs that must be used to complete processing. The resultant program, which is ready for computer execution, is called a load program (or load module)
4. It is the load program that the computer actually executes. The entire process is sometimes referred to as "compile/link-edit/go."

4.5 Utility Programs or Service Programs

1. These are designed to help, analyse, configure, optimise and maintain computer.
2. It performs general system support task such as:
 - a. Sorting and storing the data.
 - b. Checking or scanning the data stored on hard disk for security reason.
 - c. Making a copy of all information stored on a disk, and restore either the entire disk.
 - d. Performing routine data management tasks, such as deleting, renaming, moving, copying, merging, generating and modifying data sets.
 - e. Providing encryption and decryption of data.
 - f. Analysing the computer's network connectivity, configure network settings, check data transfer or log events.
 - g. Partitioning of drive into multiple logical drives, each with its own file system which can be mounted by the operating system and treated as an individual drive.
 - h. Converting data from one recording medium to another, viz., floppy disk to hard disc, tape to printer, etc.
 - i. Dumping of data to disc or tape.
3. Three types of utility programs found in most computer systems: sort utilities, spooling software, and text editors are discussed below:

May 2011

Sort utilities:

- ✓ Sort utility programs are those that sort data.
- ✓ For example, suppose we have a file of student records. We could declare “name” the primary sort key and arrange the file alphabetically on the name field.
- ✓ Sort utilities are often found in mainframe and minicomputer environments.
- ✓ In the micro-computing world, it is typical for sort routines to be bundled into application packages; for example, sort routines are commonly found in spreadsheet and database management software.

May 2013

PM

Spooling software:

- ✓ The purpose of spooling software is to compensate for the speed differences between the computer and its peripheral devices.
- ✓ It saves from being slowed down by input and output devices, many computer systems employ spooling software.
- ✓ These programs take the results of computer programs and move them from primary memory to disk.
- ✓ For example: When we give print command from different program, Operating systems assigns print job to Print Spooler and start processing other instructions. Thus, time is more allotted to processing rather than waiting for printer to finish job.
- ✓ Spooling utilities can also be used on the input side, so that programs and data to be processed are temporarily stored in an input spooling area on disk.

Text editors:

- ✓ Text editors are programs that allow text in a file to be created and modified.
- ✓ These utilities are probably most useful to professional programmers, who constantly face the problems of cutting and pasting programs together.
- ✓ Text editors lack the extensive text-formatting and document-printing capabilities found on most word processors.
- ✓ These are mainly used by programmers for writing program codes.

Some of the other commonly used utilities for microcomputer operating systems are discussed below:**1. Disk copy program –**

- a. This program allows a user to copy the entire contents of one diskette to another diskette.
- b. It is generally used to make a backup or archive copy of a data diskette or an application program.
- c. The disk copy program can also be used to transfer data stored from one size or capacity diskette to another.

2. File copy program –

- a. This program allows a user to copy just one file or a group of files, rather than the entire contents of the diskette, to be copied to another diskette.
- b. It has the same functions as a disk copy utility except that it allows an individual file or group of files to be copied.

3. **Disk formatting program** –

- a. This program allows a user to prepare a new, blank diskette to receive data from the computer system.
- b. The data cannot be stored on a diskette until it is formatted or initialized. The formatting process writes the sectors on the diskette so that the operating system is able to place data in these locations.

4. **File deletion program** - It allows a user to delete a file stored on a diskette.

5. **File viewing program** - This program is used to view the contents of a file on the display screen of the microcomputer.

6. **Directory program** –

- a. This program allows a user to view the names of the data and program files which are stored on a disk/diskette.
- b. It will not only list the files, but also will show the amount of kilobytes of memory these files occupy, the time and day they were last revised and the amount of unused storage space available on the disk/diskette.

7. **Debugging Program** –

- a. Bug means any error in source code of a programs.
- b. The process of detecting & removing such bugs is called 'Debugging'.
- c. In personal computer, if a user wants to know anything regarding the processing equipment in his computers, he/she can consult the Microsoft Diagnostic Program.
- d. The primary use of this tool was to provide detailed technical information about the user's software and hardware and then print the gathered information, usually to be used by support technicians in resolving user troubleshooting.
- e. The diagnostic routines are however also often treated as a category of the utility or service programs.

Some other System Software

Diagnostic Routines –

- a. These are the system software usually written to detect errors or problems in hardware or software components of a computer.
- b. These software also help user if he wants to know anything regarding processing equipment's in his computers. Such programs may provide details like:
 - a. Type of processor / CPU in a computer
 - b. Amount of memory [RAM] in a computer
 - c. Type of Display, etc.

Subroutine

- a. It is a small independent program containing a set of instructions which needs to be processed more than once in one or more programs.
- b. Hence, instead of writing these instruction over and over again in such programs, these are defined as a subroutine, with a separate name.
- c. A subroutine may be called any number of times from any program.

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- d. It leads to saving of time and efforts in writing and debugging program segments again and again.
- e. These are for specific task.
- f. By using this programmer can save time.

Firmware

- a. Firmware is knows a middle of Hardware & Software.
- b. Firmware or micro-programs refer to a series of special program instructions stored in CPU registers so that the most basic operations such as addition, multiplication, etc. at the CPU level are carried out.
- c. Different technologies of CPUs contain different types of Firmware.
- d. These micro programs are called firmware because these deal with very low level machine operations.

Classification of Software from commercial point of view

Except Device Drivers, Programming language & Language translators, we can divided software in following 3 categories from commercial point of view:

1. **Commercial software** comes pre-packaged and is available from software stores and through the Internet.
2. **Shareware** PM
 - a. It is software developed by individual and small companies that cannot afford to market their software worldwide or by a company that wants to release a demonstration version of their commercial product.
 - b. Shareware software often is disabled in some way and has a notice attached to explain the legal requirements for using the product.
3. **Open Source software** May 2010
 - a. It is created by generous programmers and released into the public domain for public use.
 - b. There is usually a copyright notice that must remain with the software product.
 - c. Open Source software is not public domain in that the company or individual that develops the software retains ownership of the program but the software can be used freely.
 - d. Many popular Open Source applications are being developed and upgraded regularly by individuals and companies that believe in the Open Source concept. Ex. Open Office, Ubuntu (Linux OS)

Some software is also release into the public domain without a license.

Past Questions not covered above:

May 2011

Q. Describe the advantages and disadvantages of the computer system in brief.

Advantages of Computer Systems

- (i) **Speed:** The computer is a very high speed electronic device. The operations on the data inside the computer are performed through electronic circuits according to the given instructions. Computer can perform millions of operations in one second. The computer generates signals during the process therefore the speed

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of computer is usually measure in megahertz (MHz) or gega hertz (GHz). It means million cycles units of frequency per second.

- (ii) **Accuracy**: In addition to being very fast, computer is also very accurate device. It gives accurate output result provided that the correct input data and set of instructions are given to the computer. If input data is in-correct then the resulting output will be incorrect. In computer terminology it is known as garbage-in garbage-out.
- (iii) **Reliability**: The electronic components in modern computer have very low failure rate. The modern computer can perform very complicated calculations without creating any problem and produces consistent (reliable) results. In general, computers are very reliable.
- (iv) **Storage**: A computer has internal storage (memory) as well as external or secondary storage. In secondary storage, a large amount of data and programs (set of instructions) can be stored for future use. The stored data and programs are available any time for processing.
- (v) **Automation**: A computer can automatically perform operations without interfering the user during the operations. It controls automatically different devices attached with the computer. It executes automatically the program instructions one by one.
- (vi) **Versatility**: Versatile means flexible. Modern computer can perform different kind of tasks one by one or simultaneously. It is the most important feature of computer. At one moment one can play games on computer, the next moment he/she can compose and send emails etc. In colleges and universities computers are used to deliver lectures to the students. The talent of computer is dependent on the software.
- (vii) **Communications**: Today computer is mostly used to exchange messages or data through computer networks all over the world. For example the information can be received or send through the internet with the help of computer. It is most important feature of the modern information technology.
- (viii) **Diligence**: A computer can continually work for hours without creating any error. It does not get tired while working after hours of work it performs the operations with the same accuracy as well as speed as the first one.
- (ix) **No Feelings**: Computer is an electronic machine. It has no feelings. It detects objects on the basis of instructions given to it. Based on our feelings, taste, knowledge and experience, we can make certain decisions and judgments in our daily life. On the other hand, computer cannot make such judgments at its own. Their judgments are totally based on instructions given to them.
- (x) **Consistency**: People often have difficulty to repeat their instructions again and again. Computer can repeat actions consistently (again and again) without losing its concentration. A computer will carry out the activity with the same way every time.
- (xi) **Precision**: Computers are not only fast and consistent but they also perform operations very accurately and precisely. For example, in manual calculations and rounding fractional values the value with decimal point can change the actual result. In computer however, we can keep the accuracy and precision up to the level that we desire. The lengthy calculations remain always accurate.

Limitations of Computer systems

- (i) **Programmed by human**: Though computer is programmed to work efficiently and accurately, but it is programmed by human beings to do so. Without a program, computer is nothing. A program is a set of instructions which perform particular task and if the instructions are not accurate, the working of computer will not be accurate.
 - (ii) **No Intelligence**: Although computers are faster, more diligent, accurate and versatile than human beings, it cannot replace them. Unlike human beings, computers do not have any intelligence. Its performance is depends on instructions given to it. It cannot carry any task at its own.
 - (iii) **No decision making power**: Computer cannot make any decisions nor can it render any help to solve a problem at its own like that if we plays chess with computer, the computer can take only those steps which is entered by the programmer. It cannot move at its own.
 - (iv) **Emotionless**: Computers are emotionless. They do not have emotions as human beings are having. They are simply machines which work as per the instruction given to them.
 - (v) **Curtail human Capabilities**: Although computers are great help to human beings. Sometimes, find it difficult to instantly speak out even those telephone numbers which they use every now and then as they have got the habit of using them by retrieving the storage. Further, excessive use of computers is causing various type of health injuries such as cervical and back pain, pain in eye, headache.
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