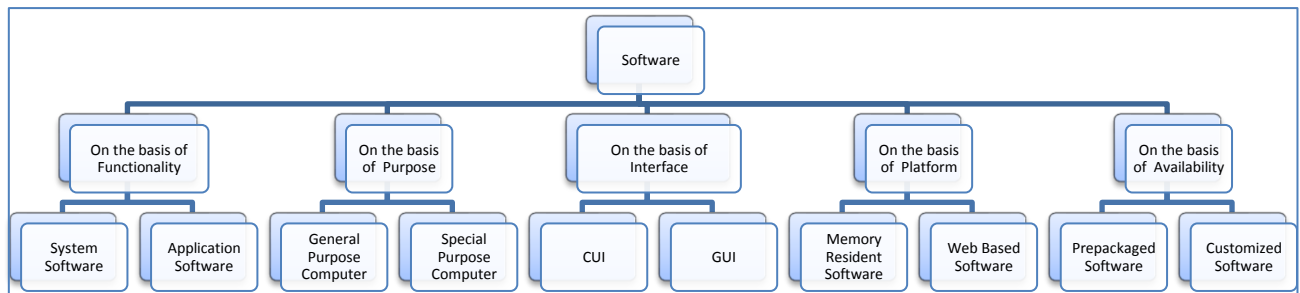


SOFTWARE

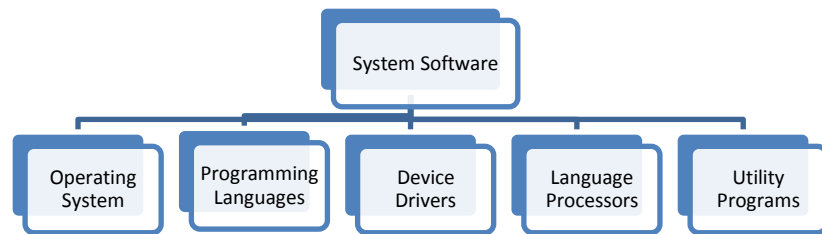
Software is any set of machine readable instructions that directs a computer's processor to perform specific operations. Software is created by grouping various related programs and a program is sequence of instructions written to solve a particular problem. For Example: Billing Software, Tally etc.

TYPES OF SOFTWARE

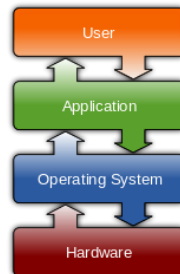


- (i) **System Software:** System software is computer software designed to operate and control the computer hardware and to provide a platform for running application software.
- (ii) **Application Software:** Application software is the software that is designed to satisfy a particular need of a particular environment. For example, software for financial management cannot be used for designing two-dimensional graphics.
- (iii) **General Purpose Software:** Software designed to meet the general requirements of user or universal in application. For example, MS Office, Media Player etc.
- (iv) **Special Purpose Software:** Software designed to meet the specific requirements of user of a particular stream. For example, Tally, Photoshop etc.
- (v) **Character User Interface:** Command based software whose interface is not user friendly and requires specialized training. For example DOS, SQL etc.
- (vi) **Graphical User Interface:** Graphic based software comprises of icons, menus and images which are user friendly and requires no specialized training. For example Windows, Tally etc.
- (vii) **Memory Resident Software:** Software which resided permanently in the hard disc of the computer and do not require internet connection for execution. For example, Tally, MS Office etc.
- (viii) **Web Based Software:** Web based software is a software package that can be accessed through the web browser. The software and database reside on a central server rather than being installed on the desktop system and is accessed over a network. For example, Gmail, Facebook etc.
- (ix) **Prepackaged Software:** Software which are packaged for sale to cater the need of general users. For example, MS Office.
- (x) **Customized Software:** Software which are tailor made as per the requirements of a specific user and designed on demand by Software company. For example, ERP.

A. SYSTEM SOFTWARE



- a) **OPERATING SYSTEM:** Operating system is a set of master programs, which is designed to control entire operation of the computer and required to run other application software.

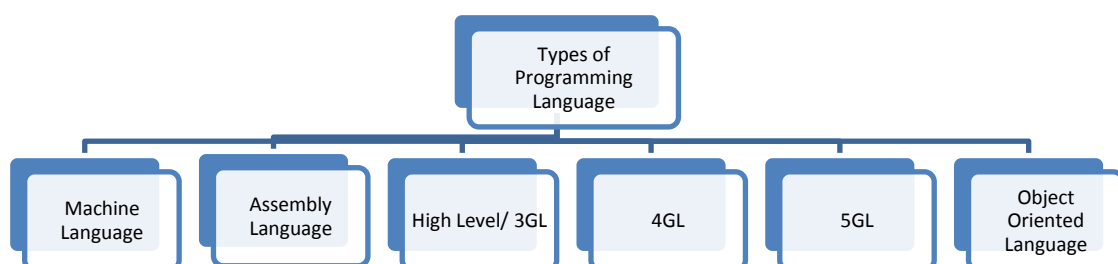


Functions of Operating System

- **Interface between User and hardware:** - Operating system converts our input to the language understandable by the hardware and converts the output to user understandable language.
- **Peripheral Management:** - The operating system manages the working of different input/output devices attached to the computer. Different input output devices like printers and scanners work under control of the operating system.
- **Memory Management:** - The operating system decides which file will be stored at which location in the memory. Both primary and secondary memories work under control of operating system.
- **Process Management:** - The operating system keeps track of the status of every running application. It makes arrangements for the generation of new applications and removal of application data from memory, which has been terminated.
- **Maintain System Security:** through password - a group of characters that identifies users as being authorized to have access to the system.
- **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.

b) Programming Language

A language used in writing programs to direct processing steps to be carried out by a computer.

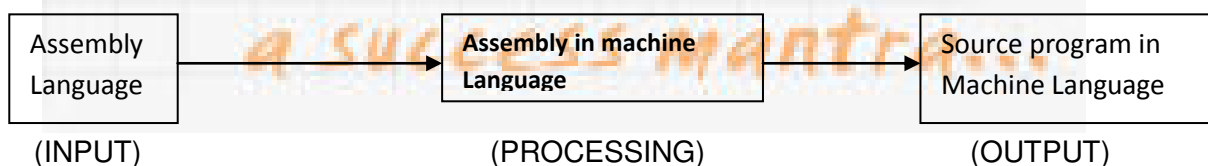


1. Machine Language (First Generation Language):

- Machine Languages are program instruction which are actually read and acted on by the computer's processing circuitry without translation.
- The machine codes are phrased in binary numbers i.e. the instructions are coded in 0 (off) or 1 (On) and are wired on the computers boards.
- For executing an instruction, the programmers converted each instruction containing the operation and the operand into binary codes.
- Integrated circuits were used to write machine languages.
- It is based on the internal engineering architecture of a computer and is the only language which the computer understands and therefore, the execution is faster.

2. Assembler Language (Second Generation Languages):

- Assembler languages are also known as **symbolic languages** since they employ symbols for both arithmetic and logical operations and location addresses.
- It requires a program called assembler which transforms an assembly language program into machine code so that the computer can execute the program.
- The problem of Machine Language was overcome to a greater extent by the usage of mnemonics. Small abbreviations were developed (e.g. - SUB, WRT, HLT) to indicate the operation codes to the computers along with a library of such symbols and abbreviations.
- The computer would then convert these symbols and abbreviations into binary digit before executing or processing them.
- Assembly Languages are easy to learn and use, the error detection and modification of the programs is easier, and also faster.
- The assembly language was still machine dependent and knowledge of machine hardware and machine level coding was required.



3. Compiler Language (Third Generation Language / High Level Languages):

- Compiler Language is high level equivalent of assembly language in which each instruction corresponds to more than one machine instructions.
- When a program has been written, it is translated to the equivalent machine code by a program compiler called compiler.
- The resulting machine code is saved separately and can be run on its own at any time.
- They are procedure oriented and plain English words are also used.
- The computer languages are universal i.e. they are not devised / developed by the manufacturer like in the case of Machine Language or Assembly Language.

Q: What is the difference between Compilers and Interpreters? Describe any two advantages of Interpreter over Compiler. (Marks 2+2) (Nov. 2013)

4. Fourth Generation Language:

- These are higher level languages than compiled languages and are designed to work with an application production spectacular effects with a minimum programming effort.

- They are non-procedural languages and they make it easier to access the computer and a user is not required to construct any detailed steps in writing a program.
- They use English like instructions, limited mathematical manipulation of data, automatic report formatting, sorting and selection of record by a given criteria.
- However, these languages are slower than Third Generation Languages and also require more computer storage capacity to perform a particular operation.

5. The Fifth Generation Languages (5GLs):-

- Language based around solving problems using constraints given to the problem, rather than using an algorithm written by programmer.
- These languages are designed to make the computer solve a given problem without the programmer. Thus the programmer needs to worry about what problem needs to be solved and what conditions need to be met, without worrying about how to implement a routine or algorithm to solve them.
- 5GL are mainly used in Artificial Intelligence research, fuzzy logic, neural network etc.
- Prolog, Mercury and CPS5 are the best known 5GLs.

6. Object Oriented Languages & Programming:

- Object Oriented Programming is a technique for creating common building block of a program called objects and assembling different sets of objects to solve specific problems.
- Object Oriented Programming Languages use a structure that defines the objects in a program along with their properties or actions. Example: C++ , JAVA.
- An object is predefined set of program code which will always behave the same way so that it can be used for other applications.
- Instead of writing the entire program line by line, the programmer combines the objects and writes small amount of codes that is necessary finishing the program.
- A class is an abstract concept for a group of related objects. All of the objects in a class inherit the characteristics of that class.
- For Example, if a class is automobiles, the members of that class inherit the class properties of having four wheels, an engine and doors.

Advantages and Disadvantages:

Advantages	Disadvantages
➤ It is a Graphical User Interface, and therefore easier to use. ➤ It enables faster program development and thereby increases the programmer productivity. ➤ Programs developed by OOPs are more reliable and contain lesser errors, since the modules used therein are already tested exhaustively.	➤ The initial development costs are very high. ➤ Larger programs produced by use of OOPs are very slow and use more memory and other computer resources.

c) Device Drivers

There are many types of input and output devices. I/O devices operate by using its own set of instructions and may understand a language that might not be understood by the operating system. So, the manufactures of these devices create special software that operates as a link between the device and the operating system. This software is called as “Device Drivers”.

Modern OS have inbuilt support for a variety of I/O devices. These OS already contain the device drivers of popular models of several popular companies. If you attach a device, whose driver is inbuilt in the OS, the device will start working as soon as you attach it with your computer. This is

called “**plug and play**” compatibility. For Example, Windows 2000, 2003 and Windows XP contains drivers of hundreds of printers, scanners and other devices.

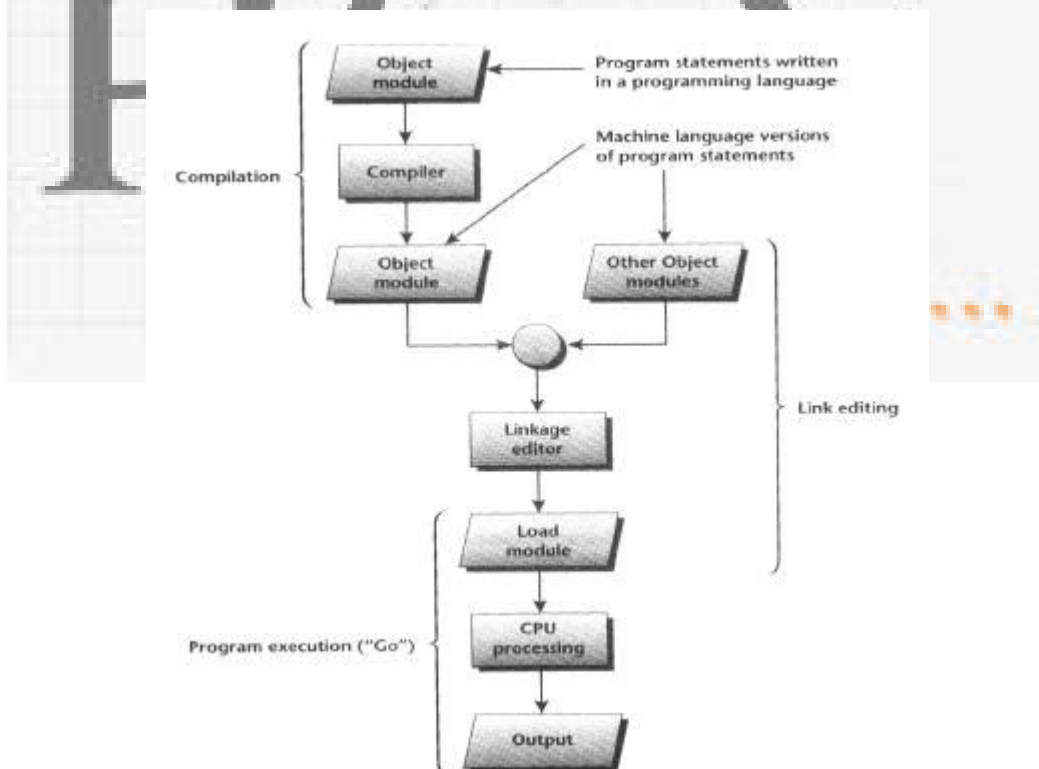
d) Language Processors

Language Processors are the type of system software that is used to convert the instructions written in one type of language into the other type. The user programs are created in computer programming languages but the computer only understands the binary language of 0s and 1s. Some mechanism is needed to convert the statement written in user understandable language into binary language and back from binary language to the user understandable language. Language translator does the same for users. There are different language processors for different types of programming languages.

- **Compilers**

The programs to create software are written by using high level languages. A compiler is system software which translates programs of high level language into the machine level language. This machine or binary language is directly understood by hardware.

The program written in high level language is called “**source program**” and the program produced by the compiler after translations is called an “object program”. The main advantage of compiler is that it translates the whole program at once. It takes more time to translate the program but the translated file executes rapidly, leading to increase performance.



- **Interpreters**

Interpreters are also used to convert a program, written in high level language to machine language. They are different in performing their job of translating high level language instructions into machine level language. Interpreters translate the program **line by line** while the program is running. Whereas, the compilers translate the program in one go after reading all its instructions.

Interpreters have relative advantages and disadvantages over compilers. An interpreter translates line by line. Thus, it has a greater speed of translation than that of a compiler. Another advantage is that the size of the interpreter itself is smaller than the compiler and they don't generate object modules thereby further leading to storage capacity saving.

The major disadvantage of interpreters is that they are less efficient in translation as compared to compilers and the programs run relatively more slowly on the interpreters. This is due to the fact that interpreters translate the instruction just before its execution. If the number of instructions is large, then a considerable amount of time is consumed and the processor is kept on waiting during this time. This results in performance degradation. This process is repeated whenever the program is executed again.

- **Assemblers**

Assembler is system software that translates the assembly language instruction into machine language. The assembler can only translate programs written in assembly language. The assembler takes a source program of assembly language and converts it into an object program or binary program that can be directly understood by the hardware. The only difference between an assembler and compiler is that the assembler is used with assembly language programs and the compiler is used with high level language programs.

Different assemblers are used to program different central processing units. This is due to the fact that each new CPU has its own set of instructions that may be different from the other CPUs. Therefore, a program written in assembly language for a particular model of a processor may not work when executed on a computer having a different processor.

e) **Utility Programs**

Utility programs are the programs provided to ensure proper functioning of the computer.

Following are some popular utility programs

- Text Editors
- Backup Utility
- Compression Utility
- Disk Defragmenter
- Antivirus Software

Text Editors: This utility program is present in almost all the popular operating systems. It is used to create or edit text files. These types of programs are generally used for creating small text files. They allow you to create new files, save files to disk, open files for editing and printing. For example: notepad.

Backup Utilities: These utility programs help us to take backup of our important data. Backups are generally taken to retrieve data in case of any damage to the original data. The files are backed up to floppies, CDs and tape drives using these programs and when there is a need, backup is restored in the system.

Compression Utilities: Compression utilities are used to compress large sized files so that they can be stored in storage of low capacity. Compression utilities reduce the size of the original file by compressing it. This compressed file can be easily transported using floppy or networks. At the destination, the same utility is used to uncompress the file. On uncompressing, the original file is retrieved. WinZip is a popular compression utility used in windows based desktops.

Disk Defragmenter: Disk defragmenter utilities are used to reduce fragments created on the disks. Fragments are the small portions of unused disk space left between the used areas of disk. On high capacity disks, several fragments are created. Due to this, parts of a single file are

stored on separate location on disk. This results into longer file access time. The disk defragmenter utilities combine the fragments to creates a large unused space and rearranges fragments of files to speed up the access. Windows contains an inbuilt disk defragmenter utility.

Antivirus Software: Antivirus software protects the computer against malicious programs called "Virus". A virus is a malicious program that disrupts the normal functioning of a computer. Antivirus software guard the computers against virus infections and removes if any, found in the files stored on disks. Advance antivirus software remains active all the time and scans each and every file being used by the computer. They also scan every file being downloaded from internet including e-mails.

B. APPLICATION SOFTWARE

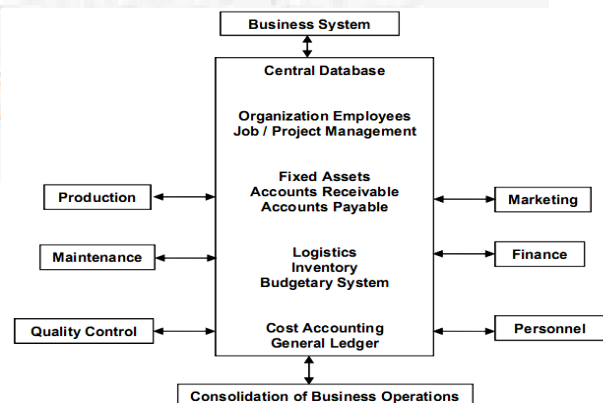
Application software is the software that is designed to satisfy a particular need of a particular environment. However, application software, designed to satisfy one purpose may be able to solve other purpose of the same user. For example, software for financial management cannot be used for designing two-dimensional graphics.

Application software is created by programmers, using high level languages. These are created by analyzing the environment and the need of the area of use. The application software will be different in terms of degree of sophistication, extent of coverage and complexity for two different environments.

Categories of application software:

(i) Enterprise Resource Planning (ERP)

"ERP system is a fully integrated business management systems that integrates the core business & management processes to provide an organization a structured environment in which decisions concerning demand, supply, operational, personnel, finance, logistics etc. are fully supported by accurate and reliable real-time information." ERPs integrate all data and processes of an organization into a single unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. Key ingredient is the use of a single, unified database to store data for the various system modules. The main objectives of ERP are:



- To provide support for adopting best business practices
 - To implement these practices with a view towards enhancing productivity and
 - To empower the customers and suppliers to modify the implemented business processes to suit their needs/ be an integral part of organization.
- For e.g. Fedena, Adaxa Suite

(ii) Decision Supports Systems (DSS)

- DSS is computer system that combines data, analytical tools and user-friendly software to support semi-structured and unstructured decision making.
- They are generally used at the management level of an organization for decision making.
- Managers require a flexible system that responds to questions that are not well defined and DSS does that role.

- They help the managers to extract essential data from other systems, apply analysis and decision procedures to the retrieved data to make unstructured decisions.

Characteristics of DSS:-

1. Support management decision making-

- Used for management planning decisions
- Operational managers use them to solve scheduling problem
- Enhance decision quality.

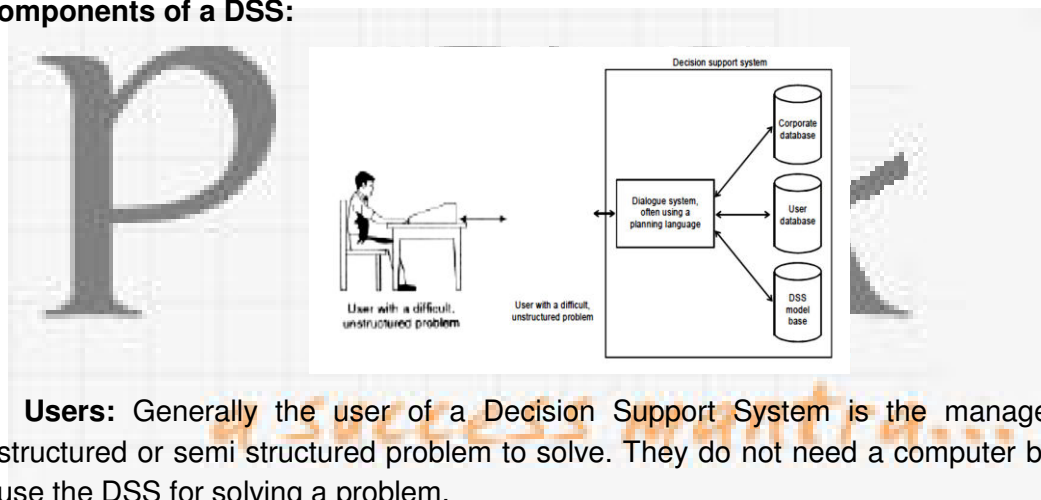
2. Solve relatively unstructured problems-

- Problem without easy solutions and which need managerial judgement in addition to structured analysis
- Typically use non-routine data as input
- To foresee any unexpected changes
- System is created to solve a particular type of problem on a regular basis
- Are flexible and handle different types of problems
- Example, Expert choice, performing data mining tasks.

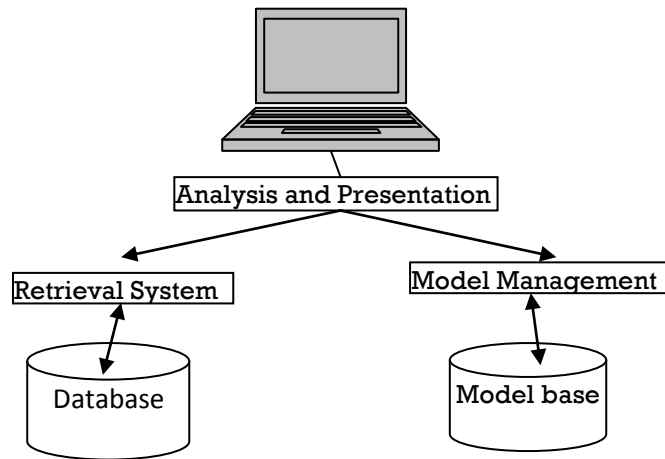
3. Friendly computer interface-

- Useful to non-programmers
- Non-procedural languages make communication between user and decision support system easy.

Components of a DSS:



1. **Users:** Generally the user of a Decision Support System is the manager with an unstructured or semi structured problem to solve. They do not need a computer background to use the DSS for solving a problem.
2. **Databases:** The database contains both routine and non-routine data from both internal and external source. The data may relate to the operating environment surrounding the organization like economic conditions, industry competition etc.
3. **Model Base:** The model base of the DSS performs data manipulations and computations with the data provided to it by the user and the database. It includes mathematical models and analytical techniques to process and manipulate the database.
4. **Planning Languages:**
 - **General Purpose Planning Language:** They allow the users to perform many routine tasks like data retrieval, analyzing etc. Example: Excel Spreadsheet
 - **Special Purpose Planning Language:** Their task is limited to performance of predefined/preprogrammed instructions. They can do their jobs better.



Q: What are Decision Support Systems? Describe various characteristics of a DSS.

(5 Marks) (PCC-Nov 2009)

Q: Explain the various components of a Decision Support System.

(4 Marks)(PCC-Nov 2007)

(iii) Artificial Intelligence

- Artificial Intelligence is the computer science field which tries to improve computers by endowing them with some of the characteristics associated with human intelligence like capacity to understand natural language and to reason under conditions of uncertainty.
- It is software that attempts to imitate aspects of human behavior like reasoning, communicating, seeing and hearing etc.

(iv) Expert Systems

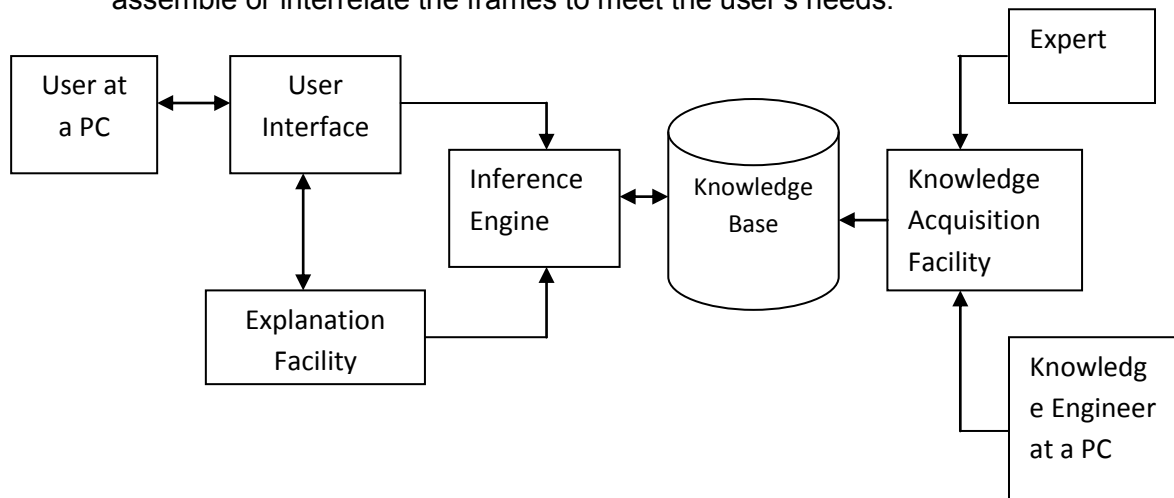
- Expert System is a system that allows a person not having any specialized knowledge or experience to make a decision.
- They contain the knowledge used by an expert in a specific field in the form “If/then” rules and an engine capable of drawing inferences from this knowledge base.
- The prompt for information required to assess the situation and express conclusions with a confidence factor.

Components of Expert System:

1. **Knowledge Base:** It 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:** Basic logic and reasoning part of the system. Data obtained from the user and Knowledge base are used to recommend a course of action.
3. **User Interface:** Allows the user to design, create, update, use and communicate with the expert system.
4. **Explanation Facility:** Explanation of logic used to arrive at its conclusion is given here.
5. **Knowledge Acquisition Facility:**
 - **Example Based:** Developers enter the facts and results of the case. They are converted to a decision tree and are used to match the case that is already stored in the knowledge base.
 - **Rule Based:** The system asks the user questions and applied the if-then-else rules to answer to draw conclusions and make recommendations. This is useful when

examples are not available or when a body of knowledge can be structured within a set of general rules.

- **Frame Based:** Organize all information about a topic into logical units called frames similar to linked records in data files. Then rules are established about how to assemble or interrelate the frames to meet the user's needs.



Advantages and Limitations:

Advantages	Limitations
➤ ES is cost-effective alternative to human experts. ➤ Knowledge of ES is representative of numerous experts so it can outperform a single human expert. ➤ ES assist users in identifying potential decision making problems, which increases the probability that sound decisions will be made. ➤ They increase productivity and preserve the expertise of an expert, if he leaves the organization.	➤ Development is costly and time consuming. ➤ Difficulty in accumulating Knowledge from experts as it is difficult for them to specify how they make a decision ➤ Common sense of a human cannot be programmed. When a situation that has not been programmed arises, the rule based system breaks down.

Q: Define an Expert System. Describe the components of an Expert System.

(5 Marks & 7 Marks)(PCC-May 2007 & June 2009)

Q: Discuss any four benefits of an Expert System. (4 Marks) (Nov., 2013)

Regards,

Ms. Niti Bansal

[Professional Careers Academy](#)

1639, First Floor, Sector 40 B,

Chandigarh – 160036

pcaclasses@gmail.com

Mobile: 9814622848, 9814098480

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