

LECTURE-1: INTRODUCTION TO COMPUTERS, DEFINITION:HARDWARE, SOFTWARE AND FIRMWARE, TYPES OF SOFTWARE

INTRODUCTION TO COMPUTERS:

A Computer is an electronic device that can perform activities that involve Mathematical, Logical and graphical manipulations. Generally, the term is used to describe a collection of devices that function together as a system. It performs the following three operations in sequence.

1. It receives data & instructions from the input device.
2. Processes the data as per instructions.
3. Provides the result (output) in a desired form.

Data : It is the collection of raw facts, figures & symbols.

Ex : Names of students and their marks in different subjects listed in random order.

Information : It is the data that is processed & presented in an organized manner.

Ex : When the names of students are arranged in alphabetical order, total and average marks are

calculated& presented in a tabular form, it is information.

Program : Set of instructions that enables a computer to perform a given task.

Advantages of computers :

1. **High speed** :Computers have the ability to perform routine tasks at a greater speed than human beings. They can perform millions of calculations in seconds.
2. **Accuracy** : Computers are used to perform tasks in a way that ensures accuracy.
3. **Storage** :Computers can store large amount of information. Any item of data or any instruction stored in the memory can be retrieved by the computer at lightning speeds.
4. **Automation** :Computers can be instructed to perform complex tasks automatically (which increases the productivity).
5. **Diligence** : Computers can perform the same task repeatedly & with the same accuracy without getting tired.
6. **Versatility** : Computers are flexible to perform both simple and complex tasks.

7. **Cost effectiveness** :Computers reduce the amount of paper work and human effort, thereby reducing costs.

Limitations of computers :

1. Computers need clear & complete instructions to perform a task accurately. If the instructions are not clear & complete, the computer will not produce the required result.
2. Computers cannot think.
3. Computers cannot learn by experience.

Generations of computers :

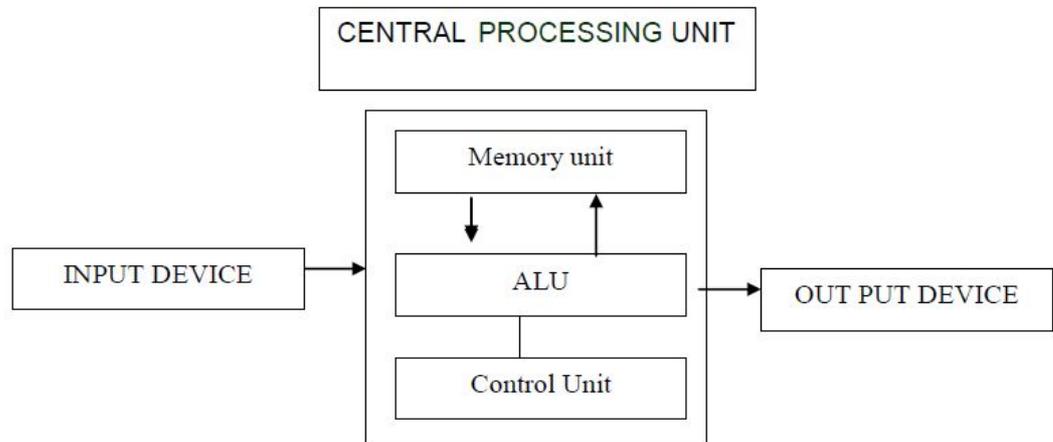
Generation	Component used
First Generation (1946-1954)	Vacuum tubes
Second Generation (1955-1965)	Transistors
Third Generation (1968-1975)	Integrated Circuits (IC)
Fourth Generation (1976-1980)	Very Large Scale Integrated Circuits (VLSI)
Fifth Generation (1980 – till today)	Ultra Scale Integrated Circuits (ULSI) Micro Processor (SILICON CHIP)

ANATOMY OF COMPUTERS

The computer system consists of three units:

1. Input device
2. Central Processing Unit (CPU)
3. Output device

Block diagram of a Computer



The various functions of these units can be summarized as:

Unit Function

1. Input device : Reads information from input media and enters to the computer in a coded form
2. CPU
 - (a) Memory unit : Stores program and data
 - (b) Arithmetic Logic unit : Performs arithmetic and logical functions
 - (c) Control Unit : Interprets program instructions and controls the input and output devices
3. Output device : decodes information and presents it to the user

Central Processing Unit: It is the part of the computer that carries out the instructions of a computer program. It is the unit that reads and executes program instructions. Hence it is known as the “brain” of the computer. The CPU consists of storage or memory unit, Arithmetic Logic Unit (ALU) and control unit.

(a). Memory Unit: It is also known as the primary storage or main memory. It stores data, program instructions, internal results and final output temporarily before it is sent to an appropriate output device. It consists of thousands of cells called “storage locations”. These cells activate with “off-on” or binary digits (0,1) mechanism. Thus a character either a letter or numerical digit is stored as a string of (0,1) Binary digits (BITS). These bits are used to store instructions and data by their combinations.

(b) Arithmetic and Logical Unit (ALU): It is the unit where all Arithmetic operations (addition, subtraction etc.) and logical functions such as true or false, male or female are

performed. Once data are fed into the main memory from input devices, they are held and transferred as needed to ALU where processing takes place. No process occurs in primary storage. Intermediate generated results in ALU are temporarily placed in memory until needed at later time. Data may move from primary memory to ALU and back again to storage many times before the process is finalized.

(c).Control Unit :It acts as a central nervous system and ensures that the information is stored

correctly and the program instructions are followed in proper sequence as well as the data are selected from the memory as necessary. It also coordinates all the input and output devices of a system .

HARDWARE and SOFTWARE

Hardware: The physical components of the computer are known as —Hardware|. It refers to the objects that we can actually touch.

Ex: input and output devices, processors, circuits and the cables.

Software: Software is a program or set of instructions that causes the Hardware to function in a desired way. The basic difference between the Hardware and Software is just the same as that exists between TV and TV studio. Without TV studio (software) from where the programs are telecast, the TV (Hardware) is a dead machine.

There are four categories of software. They are:

1. Operating System
2. Utility programs
3. Application programs
4. General purpose programs

1. **Operating System (OS)** :The software that manages the resources of a computer system and schedules its operation is called Operating system. The operating system acts as interface between the hardware and the user programs and facilitates the execution of programs.

Generally the OS acts as an interface between the user and the Hardware of the computer. i.e It is a bridge between the user and the Hardware.

The User interface provided by the OS can be character based or graphical.

CUI -- Character user Interface

GUI -- Graphical user Interface

CUI : It is operated with keyboard only. Ex: MS-DOS, UNIX

GUI : The system can be operated with mouse and keyboard. Ex: Windows 95, Windows XP etc

□ Disk Operating System (DOS): It was developed as early as 1980 by Bill Gates at the age of

19. It is suited for personal computers. Dos is a single user and single task operating system

□ WINDOWS : It works with DOS and it supports single user and multitask system. It requires a powerful PC with a minimum RAM of 8 MB .

□ UNIX ,XENIX AND LINUX: It is suited for multi-user and multi-task system

2. Utility Programs: These are pre-written programs supplied by the manufacturer for maintaining day to day activities of computer system.

Example: COPY, SORT, MAILING, virus scanning software etc.,

3.Application Programs: These are user written programs to do a specific job which can be changed to meet the individual needs. These programs are written in different languages such as BASIC or C or by using database packages like dBASE, Oracle.

Example: Payroll, Billing, Railway Reservation etc.

4. General Purpose Packages: These packages are developed to suit the needs of research workers / scientists in different fields. These packages are categorized as :

i) Data Analysis ii) Word Processing iii) Spread Sheet iv) Graphics and v) Databases

Data Analysis

Ex: SPSS (Statistical Package for Social Science),

MSTAT, MICROSTAT, GENSTAT, SAS etc.

Word Processing

Ex: WORD PERFECT, WORDSTAR, MS-Word, CHIRATOR, NORTON EDITOR etc.

Spread Sheet

Ex: LOTUS, Qpro, VP-PLANNER, SYMPHONY, MS-Excel etc.

Graphics

Ex: LOTUS, STORY-BOARD, POWER-POINT etc.

Databases

Ex: dBASE, FOX-BASE, FOX-PRO, ORACLE, MS-Access etc.

FIRMWARE:

Firmware is a software program permanently etched into a hardware device such as a keyboards, hard drive, BIOS, or video cards. It is programmed to give permanent instructions to communicate with other devices and perform functions like basic input/output tasks. Firmware is typically stored in the flash ROM (read

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only memory) of a hardware device. It can be erased and rewritten. Without firmware, a hardware device would be non-functional.

LECTURE 2: DATA REPRESENTATION, BINARY AND HEXADECIMAL NUMBER SYSTEM, ASCII AND UNICODE

Data Representation:

- a. Data refers to the symbols that represent people, events, things, and ideas. Data can be a name, a number, the colors in a photograph, or the notes in a musical composition.
- b. Data Representation refers to the form in which data is stored, processed, and transmitted.
- c. Devices such as smartphones, iPods, and computers store data in digital formats that can be handled by electronic circuitry
- d. Digitization is the process of converting information, such as text, numbers, photo, or music, into digital data that can be manipulated by electronic devices.
- e. The 0s and 1s used to represent digital data are referred to as binary digits — from this term we get the word bit that stands for binary digit.
- f. A bit is a 0 or 1 used in the digital representation of data.
- g. A digital file, usually referred to simply as a file, is a named collection of data that exists on a storage medium, such as a hard disk, CD, DVD, or flash drive.

Number systems:

Two types of number systems are:

- a. Non-positional number systems
- b. Positional number systems

Non-positional Number Systems

Characteristics

- a. Use symbols such as I for 1, II for 2, III for 3, IIII for 4, IIIII for 5, etc
- b. Each symbol represents the same value regardless of its position in the number
- c. The symbols are simply added to find out the value of a particular number

Difficulty

- a. It is difficult to perform arithmetic with such a number system

Positional Number Systems

Characteristics

- a. Use only a few symbols called digits
- b. These symbols represent different values depending on the position they occupy in the number.

Types of Positional Number Systems:

1. Decimal Number System
2. Binary Number System
3. Octal Number System
4. Hexadecimal Number System

1. Decimal Number Systems

Characteristics

- A positional number system § Has 10 symbols or digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9). Hence, its base = 10
- The maximum value of a single digit is 9 (one less than the value of the base)
- Each position of a digit represents a specific power of the base (10)
- We use this number system in our day-to-day life.

Example

$$\begin{aligned}2586_{10} &= (2 \times 10^3) + (5 \times 10^2) + (8 \times 10^1) + (6 \times 10^0) \\ &= 2000 + 500 + 80 + 6\end{aligned}$$

2. Binary Number System

Characteristics

- A positional number system
- Has only 2 symbols or digits (0 and 1). Hence its base = 2
- The maximum value of a single digit is 1 (one less than the value of the base)
- Each position of a digit represents a specific power of the base (2)
- This number system is used in computers

Example

$$\begin{aligned}
 10101_2 &= (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) \\
 &= 16 + 0 + 4 + 0 + 1 \\
 &= 21_{10}
 \end{aligned}$$

3. Hexadecimal Number System

Characteristics

- A positional number system
- Has total 16 symbols or digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F). Hence its base = 16
- The symbols A, B, C, D, E and F represent the decimal values 10, 11, 12, 13, 14 and 15 respectively
- The maximum value of a single digit is 15 (one less than the value of the base)
- Each position of a digit represents a specific power of the base (16)
- Since there are only 16 digits, 4 bits ($2^4 = 16$) are sufficient to represent any hexadecimal number in binary

Example

$$\begin{aligned}
 1AF_{16} &= (1 \times 16^2) + (A \times 16^1) + (F \times 16^0) \\
 &= 1 \times 256 + 10 \times 16 + 15 \times 1 \\
 &= 256 + 160 + 15 \\
 &= 431_{10}
 \end{aligned}$$

Converting a Number of Another Base to a Decimal Number:

Method

Step 1: Determine the column (positional) value of each digit

Step 2: Multiply the obtained column values by the digits in the corresponding columns

Step 3: Calculate the sum of these product

Numericals:

1. Convert $(10101111)_2$ into its decimal form

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Position	7	6	5	4	3	2	1	0
Bit value	1	0	1	0	1	1	1	1

$$\begin{aligned}
 (10101111)_2 &= 1 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \\
 &= 128+0+32+0+8+4+2+1 \\
 &=(175)_{10}
 \end{aligned}$$

Converting a Decimal Number to a Number of Another Base

Division-Remainder Method

Step 1: Divide the decimal number to be converted by the value of the new base Step

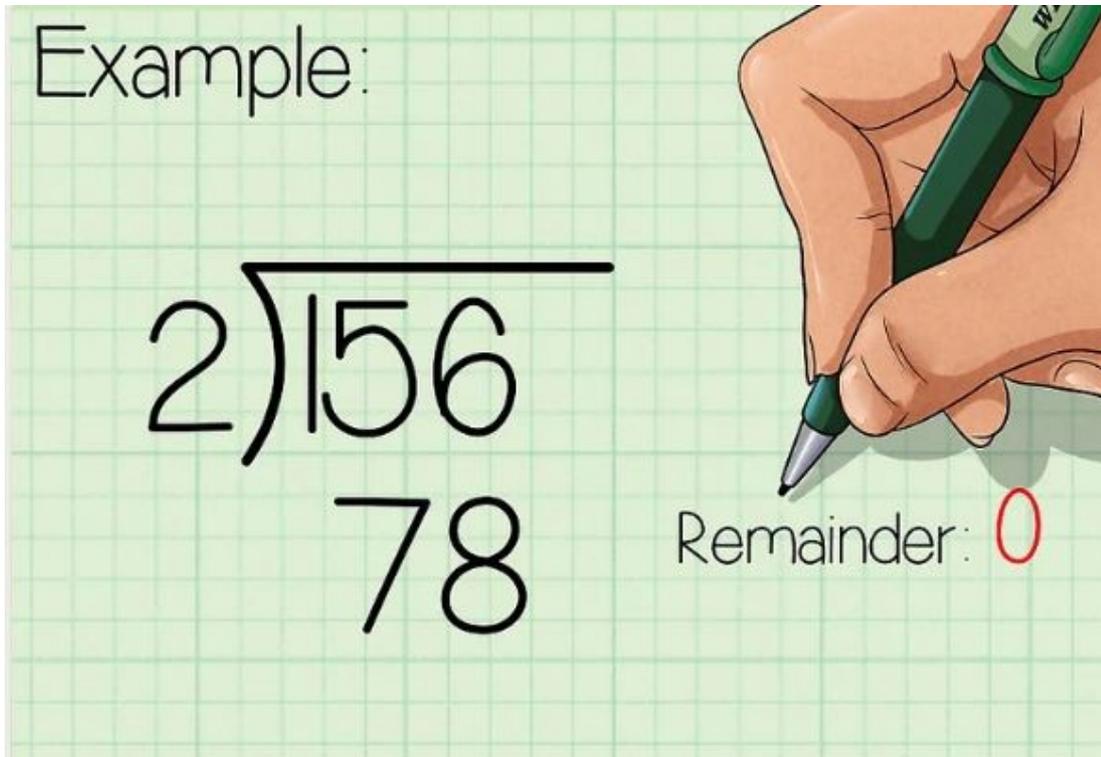
2: Record the remainder from Step 1 as the rightmost digit (least significant digit) of the new base number

Step 3: Divide the quotient of the previous divide by the new base

Step 4: Record the remainder from Step 3 as the next digit (to the left) of the new base number

Repeat Steps 3 and 4, recording remainders from right to left, until the quotient becomes zero in Step 3

Note that the last remainder thus obtained will be the most significant digit (MSD) of the new base number



Remainder:

$2 \overline{)156}$	0
$2 \overline{)78}$	0
$2 \overline{)39}$	1
$2 \overline{)19}$	1
$2 \overline{)9}$	1
$2 \overline{)4}$	0
$2 \overline{)2}$	0
$2 \overline{)1}$	1

wiki How to Convert from Decimal to Binary

Remainder:

$2 \overline{)156}$	0
$2 \overline{)78}$	0
$2 \overline{)39}$	1
$2 \overline{)19}$	1
$2 \overline{)9}$	1
$2 \overline{)4}$	0
$2 \overline{)2}$	0
$2 \overline{)1}$	1

$156_{10} = 10011100_2$

wiki How to Convert from Decimal to Binary

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CHARACTER ENCODING SYSTEMS:

1. ASCII:

ASCII stands for American Standard Code for Information Interchange. It uses numbers to represent text. Digits (1,2,3, etc.), letters (a, b, c, etc.) and symbols (!) are called characters. When there is a piece of text, ASCII converts each character to a number. This set of numbers is easier to store into the computer memory. In simple words, assigning a number to a character is called encoding.

For example, the upper case ‘A’ is assigned the number 65. Similarly, 65 refer to the letter ‘A’. Likewise, each character has a number in ASCII. The ASCII table contains all the characters with corresponding numbers. ASCII uses 7 bits to represent a character. Therefore, it represents a maximum of 128 (2⁷) characters.

ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	\$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	+	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	,	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	.	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	^	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	~	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

ASCII characters are used in programming, data conversions, text files, and graphic arts and in emails. The programmers can use ASCII to represent calculations on characters. The difference between the lower case and the upper case letter is always 32. For example, the ASCII value of ‘a’ is 97 and ‘A’ is 65. So, a – A = 32. Therefore, if the ASCII value of any letter is known, it is possible to find the ASCII value of corresponding uppercase or the

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lowercase letter. Furthermore, ASCII is used in graphic arts to represent images using characters.

One drawback of ASCII is that it can only represent 128 characters. It does not have representations for most mathematical and other symbols.

2. UNICODE:

Unicode is an alternative. It is maintained by Unicode Consortium. It covers a wide range of characters. It contains representations for letters in languages such as English, Greek, Arabic etc., mathematical symbols, emoji and many more. There are three types of encoding available in Unicode. They are UTF-8, UTF – 16 and UTF -32. UTF uses 8 bits per character, UTF-16 uses 16 bit per character and UTF-32 uses 32 bits for a character. In UTF-8, the first 128 characters are the ASCII characters. Therefore, ASCII is valid in UTF-8. Usually, Unicode is used in internationalization and localization of computer software. This standard is also used in operating systems, XML, .NET framework and programming languages such as Java.

ASCII	UNICODE
A character encoding standard for electronic communication	A computing industry standard for consistent encoding, representation, and handling of text expressed in most of the world's writing systems
Stands for American Standard Code for Information Interchange	Stands for Universal Character Set
Supports 128 characters	Supports a wide range of characters
Uses 7 bits to represent a character	Uses 8bit, 16bit or 32bit depending on the encoding type
Requires less space	Requires more space

LECTURE 3: PRIMARY, SECONDARY MEMORY, UNITS USED FOR MEASUREMENT OF MEMORY, INPUT OUTPUT DEVICES

Memory or storage capacity is one of the important components of a computer. Any storage unit of a computer system is classified on the basis of the following criteria:

1. Access time: This is the time required to locate and retrieve stored data from the storage unit in response to program instructions.
2. Storage capacity: It is the amount of data that can be stored in the storage unit.
3. Cost per bit of storage.

Units of memory: The computer stores a character in the storage cells with binary (0,1) mechanism. Thus the basic unit of memory is a bit (binary digit – 0,1). To store a character, a computer requires 8 bits or 1 byte. This is called the “word length” of the storage unit. Hence the storage capacity of the computer is measured in the number of words it can store and is expressed in terms of bytes. The different units of measurement are

8 Bits = 1 Byte

2^{10} (or) 1024 Bytes = 1 Kilo Byte (KB)

2^{10} (or) 1024 KB = 1 Mega Byte (MB)

2^{10} (or) 1024 MB = 1 Giga Byte (GB)

Types of Memory : A computer memory is of two types

1. Primary Memory (Internal storage)
2. Secondary Memory (External storage)

Primary Memory : Primary memory is also called internal memory and is an important part of a

computer. It is the main area in a computer where the data is stored. The stored data can be recalled instantly and correctly whenever desired. This memory can be quickly accessed by the CPU for reading or storing information. Primary memory is further classified into two types:

Random Access Memory (**RAM**) and Read- Only Memory (**ROM**)

RAM:

RAM is also known as read/write memory as information can be read from and written onto it. RAM is a place in a computer that holds instructions for the computer, its programs and the data. The CPU can directly access the data from RAM almost immediately. However, the storage of data and instructions in RAM is temporary, till the time the computer is running. It

disappears from RAM as soon as the power to the computer is switched off. i.e it is volatile memory.

ROM:

It is called Read-only memory as information can only be read from and not written or changed onto ROM. ROM is the ‘built-in’ memory of a computer. It stores some basic input – output instructions put by the manufacturer to operate the computer. The storage of data and instructions in ROM is permanent. It does not depend on the power supply. i.e it is non-volatile memory.

Secondary memory: The primary memory which is faster (and hence expensive) is generally not sufficient for large storage of data. As a result, additional memory, called the “auxiliary” or “secondary memory” is used. It is also referred as “backup storage” as it is used to store large volume of data on a permanent basis which can be transferred to the primary memory whenever required for processing. Data are stored in secondary storage in the same binary codes as in the main (primary memory) storage.

Some of the devices of secondary storages are Floppy Disk, Hard Disk, CD-ROM, DVD and Flash drive.

1. **Floppy Disk:** It is also referred as Diskette and is made of flexible Vinyl material. It has a small hole on one side called “Right protect notch”, which protects accidental writing/deleting the information from the disk. There is a hole in the centre through which the spindle of drive unit rotates the disk. The disks are available in two sizes of 5.25 and 3.5 inches and these could be either low density or high-density floppies. Storage capacity of floppies is measured in kilobytes (KB) and megabytes (MB). The details about the storage capacities of the floppies are presented below:

Floppy Disk	Storage Capacity	Size (Diameter)
Low Density	360 KB	5.25 inches
High Density	1.2 MB	5.25 inches
High Density	1.44 MB	3.5 inches
Extended	2.8 MB	3.5 inches

2. **Hard Disk:** The hard disk can hold more information than the floppy disk and the retrieval of information from hard disk is faster when compared to floppies or tapes. A hard disk is fixed inside the CPU and its capacity ranges from 20 MB onwards. The hard disk is made up of a collection of discs (one below the other) known as platters on which the data is recorded.

These platters are coated with magnetic material. It is less sensitive to external environmental disorders and hence the storage in hard disk is safe. A small hard disk might be as much as 25 times larger than a floppy disk. Storage Capacity of hard disks varies from 20 MB to several Gega bytes like 80GB, 160GB.

3. **CD-ROM:** CD-ROM stands for Compact Disk–Read Only Memory. It is used to store a wide variety of information. Its main advantage is that it is portable and can hold a large amount of data. The storage capacity of most CD-ROMs is approximately 650 MB or 700 MB.

CD-ROMs have the following variations:

(i) CD-R(Compact disc Recordable): Data can be written onto it just once. The stored data can be read. Data once written onto it cannot be erased.

(ii) CD-RW(Compact disc Rewritable): It is also called erasable CD. Data once written onto it can be erased to write or record new information many times.

To use a CD-ROM, a device called CD drive is needed.

4. **DVD:** DVD stands for Digital Versatile Disc. It is similar to a CD-ROM, except that it can store larger amounts of data. The storage capacity of a DVD is at least 4.7MB. DVDs that can store up to 17GBs are also available. Because of their capacity, DVDs are generally used to store a very large multimedia presentations and movies that combine high quality sound and graphics.

5. **Flash Drive:** It is a small, portable device that can be used to store, access and transfer data. Due to its small size, it is commonly called **Pen drive**. It is also called USB drive. We can read, write, copy, delete, and move data from computer to pen drive or pen drive to computer. It comes in various storage capacities of 2GB, 4GB, 8GB etc. It is popular because it is easy to use and small enough to be carried in a pocket. This device is plugged into the USB port of the computer and the computer automatically detects this device.



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DISTINGUISH BETWEEN PRIMARY AND SECONDARY MEMORY

BASIS FOR COMPARISON	PRIMARY MEMORY	SECONDARY MEMORY
Basic	Primary memory is directly accessible by Processor/CPU.	Secondary memory is not directly accessible by CPU.
Altered Name	Main memory.	Auxiliary memory.
Data	Instructions or data to be currently executed are copied to main memory.	Data to be permanently stored is kept in secondary memory.
Volatility	Primary memory is usually volatile.	Secondary memory is non-volatile.
Formation	Primary memories are made of semiconductors.	Secondary memories are made of magnetic and optical material.
Access Speed	Accessing data from primary memory is faster.	Accessing data from secondary memory is slower.
Access	Primary memory is accessed by the data bus.	Secondary memory is accessed by input-output channels.
Size	The computer has a small primary memory.	The computer has a larger secondary memory.
Expense	Primary memory is costlier than secondary memory.	Secondary memory is cheaper than primary memory.
Memory	Primary memory is an internal memory.	Secondary memory is an external memory.

DISTINGUISH BETWEEN RAM AND ROM

BASIS FOR COMPARISON	RAM	ROM
Basic	It is a read-write memory.	It is read only memory.
Use	Used to store the data that has to be currently processed by CPU temporarily.	It stores the instructions required during bootstrap of the computer.
Volatility	It is a volatile memory.	It is a nonvolatile memory.
Stands for	Random Access Memory.	Read Only Memory.
Modification	Data in RAM can be modified.	Data in ROM can not be modified.
Capacity	RAM sizes from 64 MB to 4GB.	ROM is comparatively smaller than RAM.
Cost	RAM is a costlier memory.	ROM is comparatively cheaper than RAM.
Type	Types of RAM are static RAM and dynamic RAM.	Types of ROM are PROM, EPROM, EEPROM.

Input Devices

Devices used to provide data and instructions to the computer are called Input devices.

Some important input devices are Key board, Mouse, Scanner, MICR, Web camera, Microphone etc.

1. **Keyboard:** The Key board is used for typing text into the computer. It is also known as standard Input device. A computer keyboard is similar to that of a type writer with additional keys. The most commonly available computer keyboard has 104 keys.

There are different types of keys on the keyboard. The keys are categorized as :

- Alphanumeric keys , including letters & numbers.
- Punctuation keys, such as colon (:), semicolon (;) Question mark (?), Single & double quotes (‘, ’)
- Special keys such as arrow keys, control keys, function keys (F1 to F12), HOME, END etc.

2..**Mouse:** It is a device that controls the movement of the cursor on a monitor. A mouse will have 2 buttons on its top. The left button is the most frequently used button. There will be a wheel between the left and right buttons. This wheel enables us to smoothly scroll through screens of information. As we move the mouse, the pointer on the monitor moves in the same direction. Optical mouse is another advanced pointing device that uses a light emitting component instead of the mouse ball. Mouse cannot be used for entering the data. It is only useful to select the options on the screen.

3. **Scanner:** : It is an input device that can read text or illustrations printed on paper and translate into digital form. The main advantage of these scanners is that the data need not be entered separately resulting in saving lot of time.

Scanners are of two types: i) optical scanners ii) MICR

i) Optical scanners:

a. Optical character Recognition(OCR): In this, characters are read with the help of a light. This is used in office atomization, documentation in library etc.

b. Optical mark recognition(OMR): It is a technology where an OMR device senses the presence or absence of a mark such as a pencil mark. OMR is used in tests such as aptitude tests.

c. Optical barcode recognition(OBCR): Barcode readers are photoelectric scanners that read the barcodes or vertical zebra striped marks printed on product containers. This is used in super markets, bookshops etc.

4. Magnetic Ink Character Recognition(MICR): : It is a character recognition technology used primarily by the banking industry to facilitate the processing of the cheques. MICR characters (chequeNo., Acc.No.etc) are printed in special ink usually containing iron oxide. When a document that contains the ink needs to be read, it passes through a machine which magnetizes the ink and there will be a reader sorter unit which translates the magnetic information into characters. MICR provides a secure, high speed of scanning and processing information. It scans about 2600 cheques/min.

Output devices

Any device that is capable of representing information on a computer is called an Output device.

Output devices receive information from the CPU and present it to the user in the desired form.

Some important Output devices are : Monitor, Printer

1 .Terminal/Monitor: It is similar to TV screen- either a monochrome (black & white) or colour – and it displays the output. It is also referred as Visual Display Unit(VDU). Several types of monitors are in use. Some of them are Colour Graphic Adapter(CGA), Enhanced Graphics Adaptor(EGA) , Video Graphics Adapter (VGA) and Super Video Graphics Adapter (SVGA).

The screen sizes differ from system to system. The standard size is 24 lines by 80 characters. Most systems have provision for scrolling which helps in moving the text vertically or horizontally on the screen.

2 . Printer: A printer is used to transfer data from a computer onto paper. The paper copy obtained from a printer is often referred as “printout”. The different printers and their speeds are as follows:8888222501

S. No.	Type	Mode of Printing	Speed
1	Dot – Matrix printer	Prints the character in dotted pattern through printer ribbon using either 24 pin or 9 pin	200/300 to 700 CPS
2	Ink Jet printer	Work by spraying ionized ink	Slow, 90 CPS
3	Laser printer	Also called page printer. Uses laser beam to produce an image.	6 to 12 PPM
4	Line printer	Prints lines at a time instead of single characters.	300 to 600 LPM
5	Plotter	Produces drawings or graphs through pens which are filled with different colours.	

(CPS: Characters Per Second; PPM: Pages Per Minutes; LPM : Lines Per Minute)

LECTURE 4: OPERATING SYSTEMS. DEFINITIONS AND TYPES

Operating system is a set of software that controls and manages hardware and basic system operations for a computer. The operating system loads programs into the computer's memory, runs these programs, and manages peripherals like disks and printers.

Functions of Operating Systems:

1. User Interface

The user interface is the software layer, sometimes called the shell, through which the user communicates with the OS. The OS, in turn, communicates with the computer. Thus, the user interface includes the command processor, which loads programs into memory, as well as the many visual components of the operating system (what you see when you look at the display).

2. Job Management

Job management is an operating system function that controls the order and time in which programs are run. Two examples of programs that may perform this function are a scheduling program that schedules other programs or batch files to run on a certain day and time, and a print program that manages and prioritizes multiple print jobs.

3. Task Management

Task management is an operating system function found in multitasking operating systems. Multitasking implies that a computer is simultaneously running two or more programs (tasks) at the same time. In reality, a computer cannot run more tasks simultaneously than the number of processors that exist within the computer. In Windows, this application runs in the current window – the window that is on top of other windows on the screen and the window that receives input from the keyboard when the user types.

4. Memory Management

Memory management is an operating system function that manages the placement of programs and data in memory, while keeping track of where it put them. In the case of advanced operating systems, such as Windows XP and later Windows versions, this involves a scheme for making optimal use of memory

5. File Management

File management, also referred to as data management, is an operating system function that allows the operating system to read, write, and modify data, while managing the logical storage of the data. Each operating system has at least one scheme of logical organization, called a file system. A file system is the logical structure used on a storage device for the purpose of storing files, as well as the code within an operating system that allows the OS to store and manage files on a storage device.

TYPES OF OPERATING SYSTEMS:

1. Single-User/Single-Tasking

A single-user/single-tasking operating system is one that allows only a single user to perform a single task at a time. A task is a function such as reading a file from disk, performing a math calculation, printing a document, or sending a request over the Internet to a Web server. Small and simple OSs can only manage a single task at a time. Examples of single-tasking OSs are MS-DOS and the Palm OS, used on the palmOne handheld computers.

2. Single-User/Multitasking

An operating system that allows a single user to perform two or more functions at once is a single user/multitasking operating system. Early versions of both Microsoft Windows and the Macintosh operating systems were examples of this category

3. Multiuser/Multitasking Operating Systems

A multiuser/multitasking operating system allows multiple users to run programs simultaneously. We have had such operating systems for decades on mainframes and on today's network servers, sometimes called terminal servers. The desktop operating systems we survey in this book – Windows XP, Windows Vista, Windows 7, Linux, and Mac OS X – all are multiuser/multitasking operating systems with one caveat: only one user at a time can interactively log into the computer. However, a logged on user can simply log out, and leave their entire session of open applications and windows intact, and another user can log in and run a separate session, thus switching the current user. Therefore, Windows OSs support multiple but not simultaneous interactive users.

4. Real-Time Operating Systems

A real-time operating system (RTOS) is a very fast and relatively small OS. Often embedded, meaning it is built into the circuitry of a device and not normally loaded from a disk drive, a real-time operating system runs realtime applications. It may support multiple simultaneous tasks or it may only support single tasking. A real-time application responds to certain inputs extremely quickly – thousandths or millionths of a second (milliseconds or microseconds, respectively). They run medical diagnostics equipment, life-support systems, machinery, scientific instruments, and industrial systems. Real-time OSs are used in aviation and aerospace where the code must run within the allotted time.

Examples of real-time operating systems include BlueCat Linux by LynuxWorks, QNX Neutrino by QNX Software Systems, Operating System Embedded (OSE), pSOS, and Windows CE.

LECTURE 5: FILE MANAGEMENT

File Management

An operating system must provide a number of operations associated with files so that users can safely store and retrieve data. Typical operations are: Open, Close, Create, Copy, Rename, List.

In addition, operations on single data elements within a file are supported by: Read, Write, Seek.

File Control Blocks: File control blocks (FCB), sometimes referred to as file descriptors, are data structures that hold information about a file. When an operating system needs to access a file, it creates an associated file control block to manage the file. The structure of the file control block differs between operating systems, but most file control blocks include the following parts:

- Filename
- Location of file on secondary storage
- Length of file
- Date and time of creation or last access.

a. File names

Each operating system uses a specific convention or practice for naming files. MS-DOS Uses eight character file names, a dot, then a three-character extension that denotes the type of file. Filenames are not case-sensitive. UNIX Filenames can be up to 254 characters long and are case-sensitive. Windows Filenames can be up to 255 characters long and are not case-sensitive.

b. File types

File types refer to classifying the content of the file, such as a program, text file, executable program or data file. In Windows operating systems, the file type is derived from the filename extension. Typical file types and their extensions are:

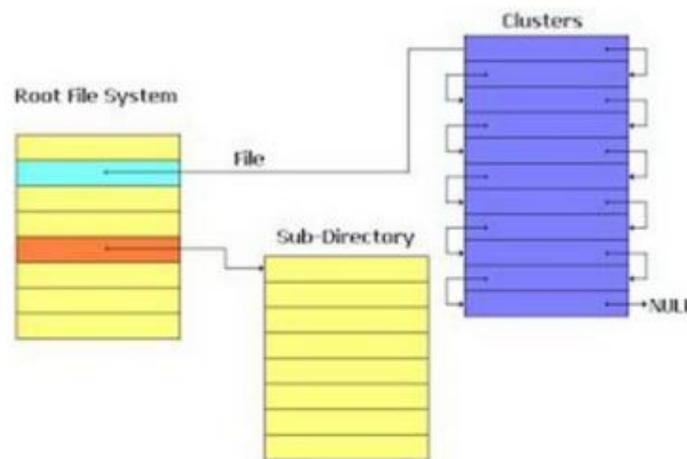
File Extension	File Type
.bas	basic source program
.c	c source program
.dll	system library
.doc/.docx	Word document
.exe	executable program
.txt	text file
.mp3/.wav	Music Player Format
.mp4/.flv/.3gpp	Video File Format

c. Track of files

The hard disk is comprised of a large number of sequentially numbered sectors. As files are created, free sectors are allocated to hold the file contents and marked as allocated. To keep track of the sectors and whether they are allocated or free, and to which file they belong, the operating system maintains a number of tables.

d. Root file system

When the operating system is first installed, it creates a root file system on the disk that specifies how many sectors are available and how they will be allocated. The root file system is a table of entries like a directory. In general, this is a fixed size, and once full, no more entries can be added. Each entry can be either a file or another directory table. The following table depicts this structure



e. File systems supported by Windows operating systems

The Windows operating system supports the following file systems:

FAT	The MS-DOS operating system introduced the File Allocation Table system of keeping track of file entries and free clusters. Filenames were restricted to eight characters with an additional three characters signifying the file type. The FAT tables were stored at the beginning of the storage space.
FAT32	An updated version of the FAT system designed for Windows 98. It supports file compression and long filenames
NTFS	Windows NT introduced the NT File System, designed to be more efficient at handling files than the FAT system. It spreads file tables throughout the disk, beginning at the center of the storage space. It supports file compression and long filenames.

LECTURE 6: APPLICATIONS USED FOR DOCUMENT CREATION AND EDITING, DATA PRESENTATION USING SLIDES

WORD PROCESSING

Definition: Word-processing is essentially typing, editing, and manipulation of a document in a desired form.

Units of the Document:

Since word-processing is concerned with preparation of a document (in a desired form), it is essential to know the units of the document:

1. Character: It refers to the alphabets, numerical digits, punctuations and other special symbols which are commonly used in the text.
2. Word: A word is group of characters that are separated from other group of characters by some delimiters like, comma, full stop and space.
3. Sentence: A sentence is a group of words preceded and followed by appropriate delimiting characters.
4. Paragraph: It is a group of one or more sentences, paragraphs are separated by leaving blank lines between them.
5. Pages: It is the amount of text that can be printed on one page of a paper.
6. Chapters: It is a collection of pages
7. Documents and files: It is a group of chapters. Usually, a complete document may be very short such as a memo(or letter) or very long such as a book consisting of several chapters. These documents are referred as “Files”.

Features of Word-processing:

1. Word-wrap
2. cursor control
3. editing
4. formatting
5. spell-check
6. thesaurus
7. macros
8. printing
9. file management
10. mail merge printing

Word-processing Packages: Several word-processing packages are available. Some of these are listed

below:

1. MSWORD (SOFT WORD) 2. WORDSTAR 3. CHIRATOR 4. NORTON EDITOR

MS-WORD

MS- Word is a word processor. The extension name of MS- word is **.doc**. It is an application used to create, edit, print and save a document. It allows the user to insert pictures, tables, charts, drawings & features that will make the text richer & more interactive.

(The term document refers to a file created using word processor)

Starting MS-Word:

Start ----All Programs ----MS-office----MS-word

MS-word icon is **W**.

Microsoft Word uses a toolbar and a main ribbon to allow you to modify your document. Within this ribbon, you can switch between tabs to determine what you would like to do. These tabs include Home, Insert, Design, Layout, References, Mailing, Review, and View. These tool bar and these tabs are discussed in more detail below.

The **Home** Tab (Figure 5) is Microsoft Word's standard view. This is the view most widely used and allows you to format text by Font Style, Font Size, Bold, Italic, Underline, Alignment, Numbered List, Bulleted List, Indentation, Spacing, and Font Color.



Figure 5. Home Tab

The **Insert** Tab (Figure 6) contains any additives you want to place in your document, including but not limited to: Tables, Online Picture/Clip Art searches, Headers, and Footers. These icons are convenient and will bring up a dialogue box to give you further options when clicked.



Figure 6. Insert Tab

The **Layout** Tab (Figure 8) contains icons for page setup and paragraph actions, such as Margin, Orientation, Size and Columns.

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Figure 9. References Tab

The **Review** Tab (Figure 11) is where one can find Spelling & Grammar, the built in Thesaurus and Dictionary, you can Track Changes, Check Word Count, and Show/Add Comments



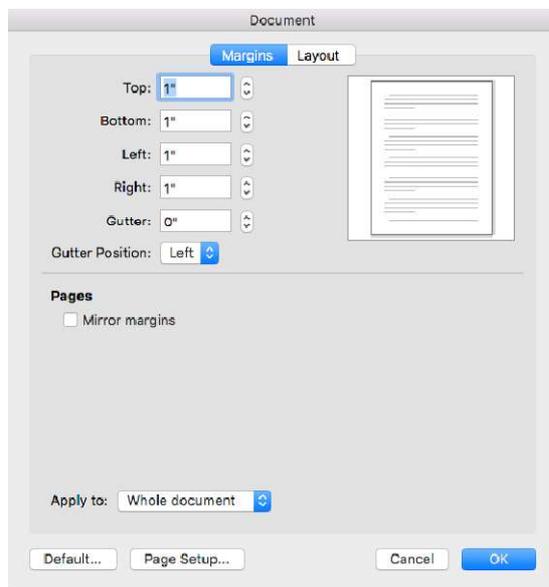
Figure 11. Review Tab

The **View** Tab (Figure 12) allows you to change the views of your document.



Figure 12. Review Tab

Formatting The Document: The default page margins for Microsoft Word documents are 1 inch, but you may want to change them for a project. To change the page margins, go to Layout > Margins button. The Margins button will display a dropdown menu that shows some margin presets. If you wish to set different margins, select Custom Margins. A menu will appear where you can type irregular Margins (Figure 13).

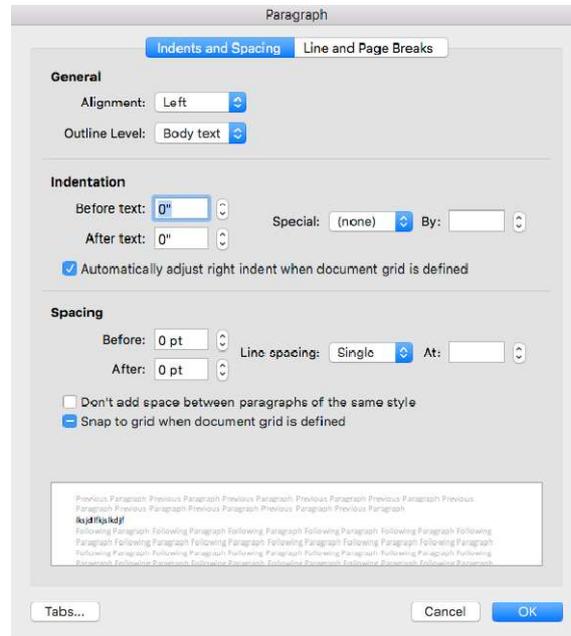


Formatting Paragraphs

To format your paragraph, first highlight the paragraph you wish to format. To highlight more than one paragraph, click at the beginning of the paragraph and drag the mouse over the text. To apply changes to the entire document select all by pressing Command + A. To specify

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Alignment, Line Spacing, Indentation, and Page Break utilize the various options of the Home Tab or go to Format > Paragraph. This will Open up the Paragraph menu (Figure 14).



Cut, Copy, and Paste

You can use the Cut, Copy, and Paste features of Word to change the order of sections within your document, to move sections from other documents into new documents, and to save yourself the time of retyping repetitive sections in a document. Cut will actually remove the selection from the original location and allow it to be placed somewhere else. Copy allows you to leave the original selection where it is and insert a copy elsewhere. Paste is used to insert whatever has been cut or copied.

To Cut or Copy:

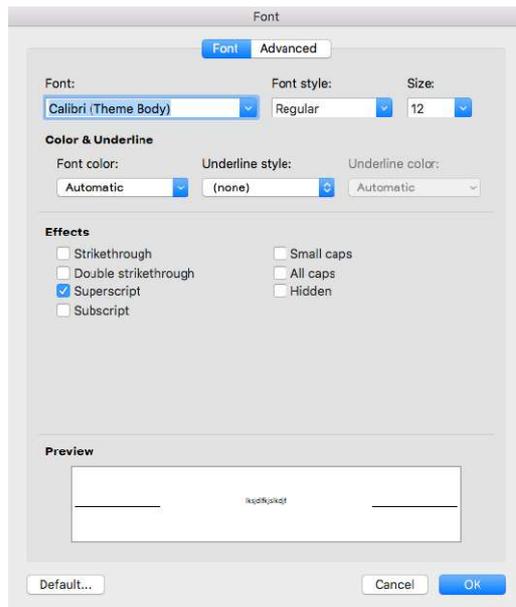
Highlight the text by clicking and dragging over the text to be cut or copied. Go to Home Tab > Clipboard Box > Copy (Command + C) or Home Tab > Clipboard Box > Cut (Command + X). Click the location where the information should be placed. To go Home Tab > Clipboard Box > Paste (Command + V). The clipboard box is shown in Figure 15.



Formatting Text

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Before you type, you should select your font style, size, color and attributes (such as bold, italic and underline) in the Home Tab. You can expand the Font Menu box to get more options by clicking Format > Font (Command + D) (Figure 16). However, if you wish to change text that has already been typed, click and drag over the text to be changed to highlight it and change it as before.



Numbered and Bulleted Lists

To create a simple numbered or bulleted list, click on the Numbering or Bullet button on the Paragraph toolbar in the Home Tab (Figure 17). To have more control over the format of your list, click the down arrows beside each style of list. Type the first item in the list and press Return to move to the next number or bullet. Press Return twice to exit the list. Press Tab to indent and move to the next level of your list. Press Shift + Tab to move back a level.



Headers and Footers

Headers and Footers can be used to give a uniform look to the pages of your document. To create one, go to Insert Tab > Header or Insert Tab > Footer. When clicking either button, a drop down menu with presets will show. If you wish to edit your own settings click either the Edit Header or Edit Footer buttons (Figure 19). If you wish to delete the header or footer you placed in your document, simply click Delete Header or Delete footer on the buttons drop down menu.

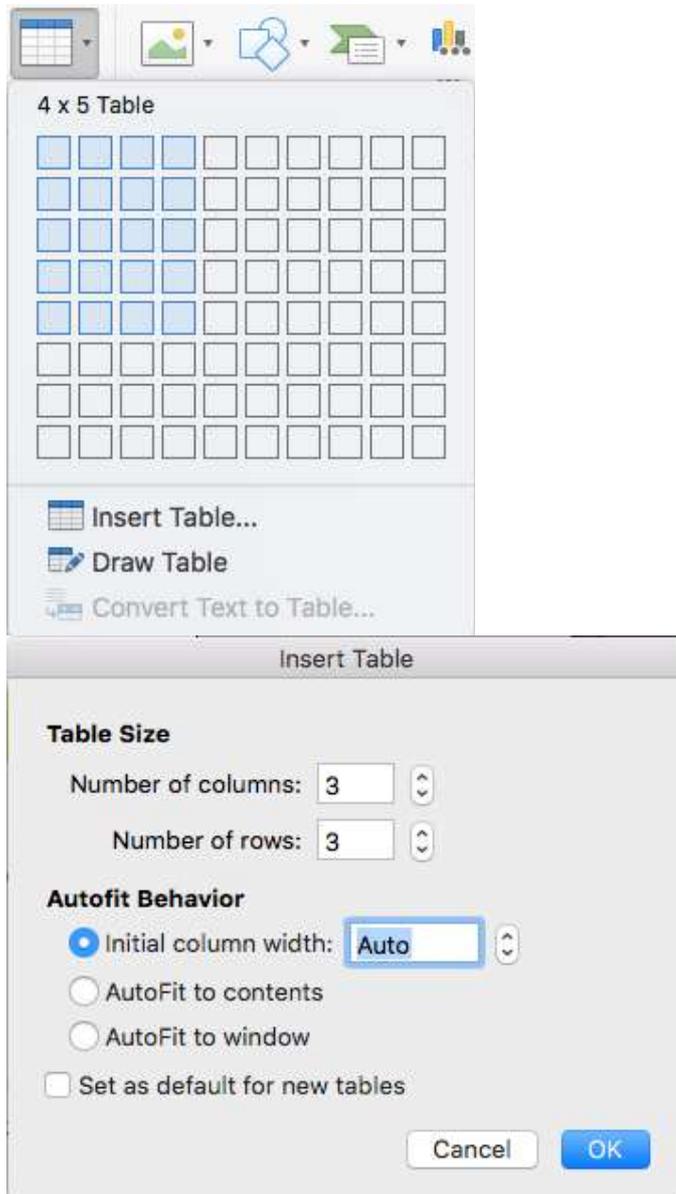


INSERTING AND ADDING OBJECTS

There are many different elements that could be added to your word document. To find these various options, go to the Insert Tab. Some of the most commonly used elements are Tables, Pictures, Shapes, Charts, and Word Art. How to use these elements will be discussed in more detail below.

Table

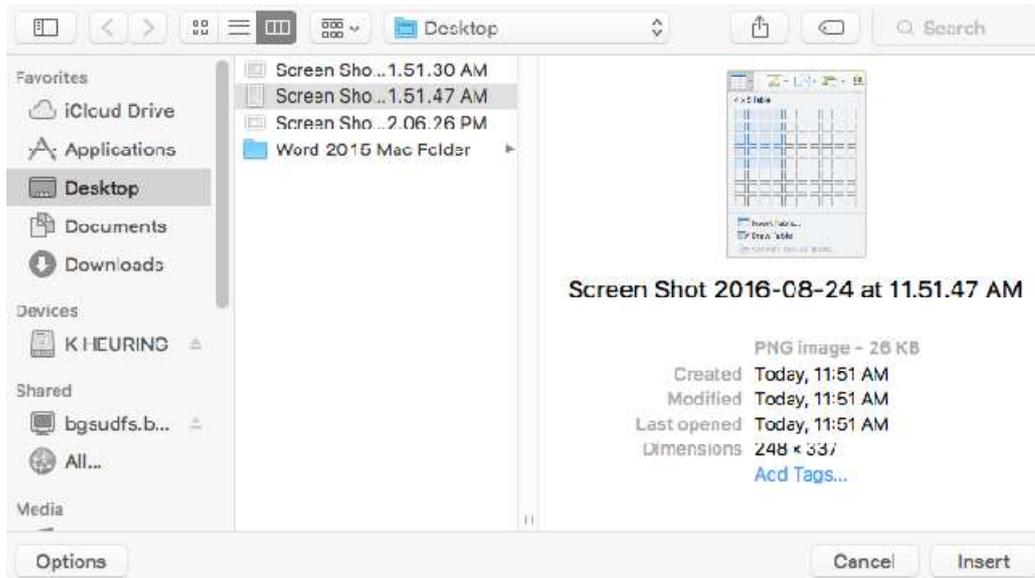
To insert a table, go to the Insert Tab > Table. This will display a box where you can select how many columns and rows you would like your table to be by hovering over them (Figure 20). For more detailed options, click Insert Table. This will bring up the insert table display box. Here you can specify how many rows and columns the table has as well as how the content fits into the boxes (Figure 21).



Pictures

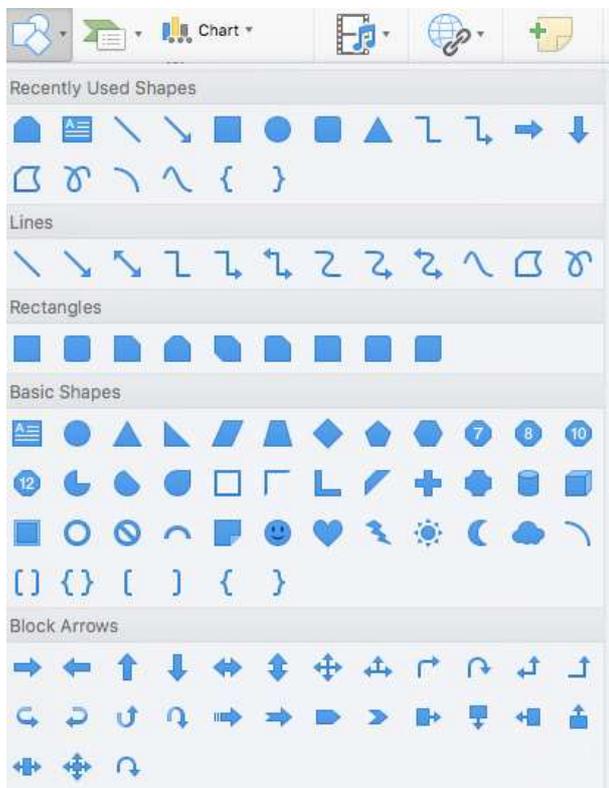
To insert a picture, go to the Insert Tab > Pictures > Picture from File. This will bring up a file locator where you can navigate to where the picture you would like to insert is saved (Figure 22). Once you have found your photo, select the file and then click Insert.

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Shapes

To insert a shape, go to the Insert Tab > Shapes. This will bring up a menu of shapes that you can select from (Figure 23). Once you have found the shape you would like to insert, single click the shape to select it. Then you will click and drag in the document to draw your shape.

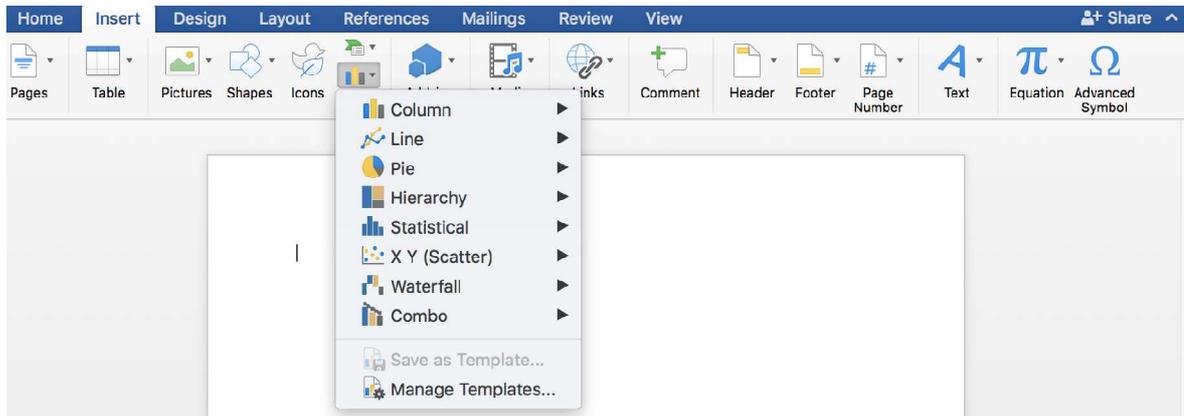


Charts

To insert a chart, go to the Insert Tab > Then click on the small box with 3 Columns This will bring up subcategories of chart types. When you hover over a category, the charts available will display

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on the right side with a new pop out menu. When you have found the chart you would like to insert, single click the chart (Figure 24). This will place a chart in word that displays. It will also open up Microsoft Excel with the data for you to go in and change the content. As you change the content in Excel, the content in Word will change automatically.



WordArt

Microsoft Word has a library of stylized text called WordArt. To insert WordArt, go to the Insert Tab > WordArt. This will bring up a quick menu of all the styles you can choose from (Figure 25). Select one of the options and single click it. This will place an editable text box in your document.

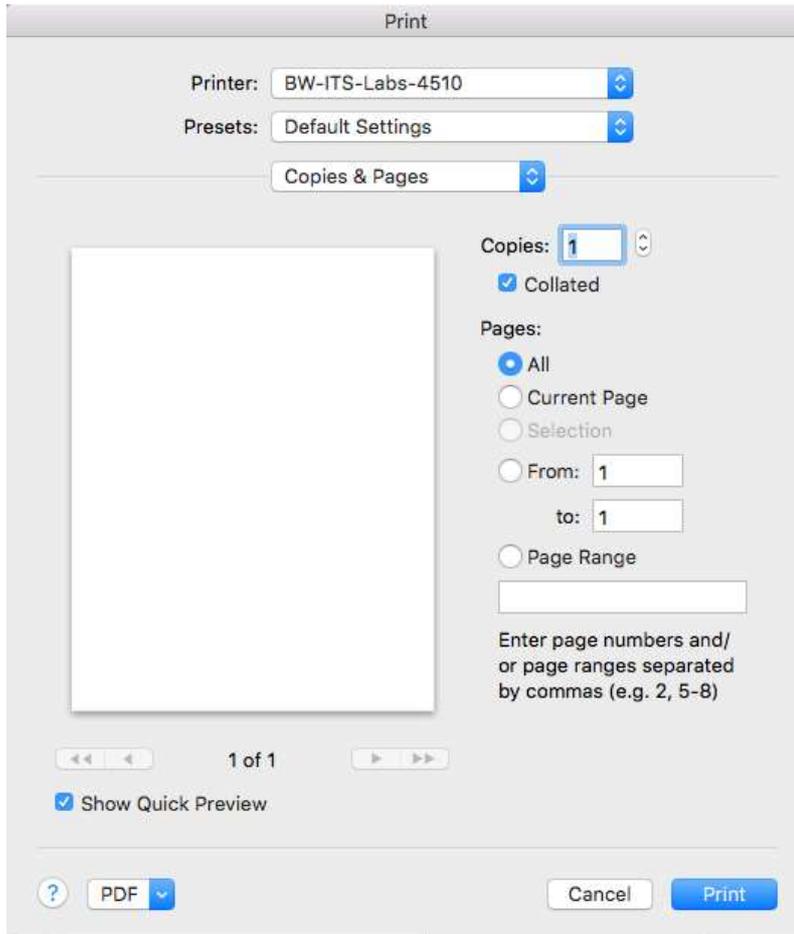


PRINTING

Print Preview

Before you print your document, you may want to preview it to make sure you are happy with the page layout and appearance of your document. To do this, in the toolbar click File > Print. This opens a preview of your document (Figure 26). In the preview, you have the options to choose the printer, select preset settings, decide the number of copies to be printed, as well as select a single or range of pages from an entire document to print. If you need to make changes to your document at this point, click Cancel in the bottom right corner of the dialog box.

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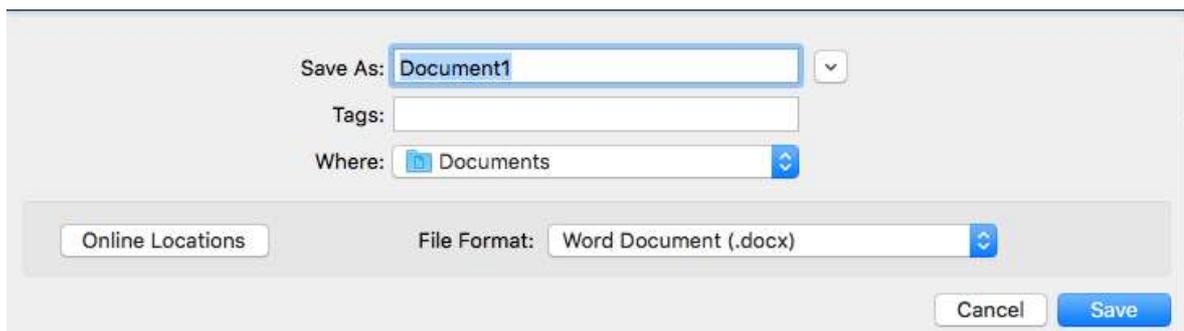


Printing

To print your document, go to File > Print. When your document looks how you want it and all the settings are put in, click Print in the bottom right corner.

Saving as a PDF

To save your document in the PDF file format, go to File > Save As. The saving dialog box (Figure 27) will appear where you can rename your document, select the saving destination, and select the file format of the document.



Click on Word Document (.docx) to access the file format drop down menu. In this drop down menu, select PDF. Once PDF is visible in the file format selection box, click Save.

OTHER HELPFUL FUNCTIONS

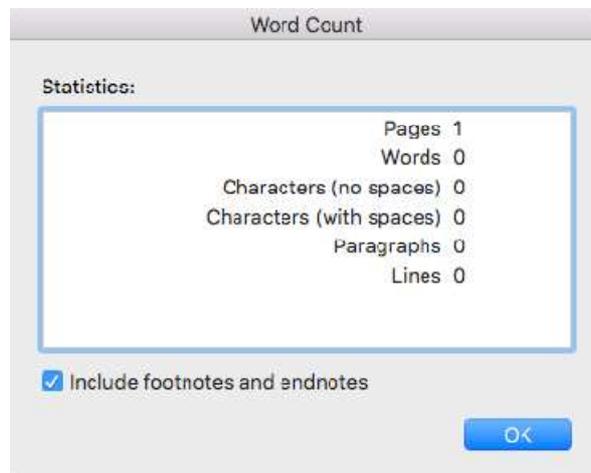
Undo and Redo

The easiest way to undo an action is with the key commands Command + Z and to redo an action with Command + Y. It is important to note that not all actions are undoable, thus it is important to save before you make any major changes in your document. You also can find the Undo and Redo icons (figure 28) above the Main Ribbon. The left icon is Undo and the right icon is Redo.



Word Count

To get an accurate word count of your document, go to Review Tab > Word Count. This will give you the total number of words in your document (Figure 29). If you need to word-count a specific section, highlight that section first by clicking and dragging over it and then go to Review Tab > Word Count.



Quitting

Before you quit, it's a good idea to save your document one final time. Go to Word > Quit Word or use the command keys Command + Q (Figure 30). This is better than just closing the window, as it insures your document quits correctly.



SHORTCUT KEYS FOR MICROSOFT OFFICE

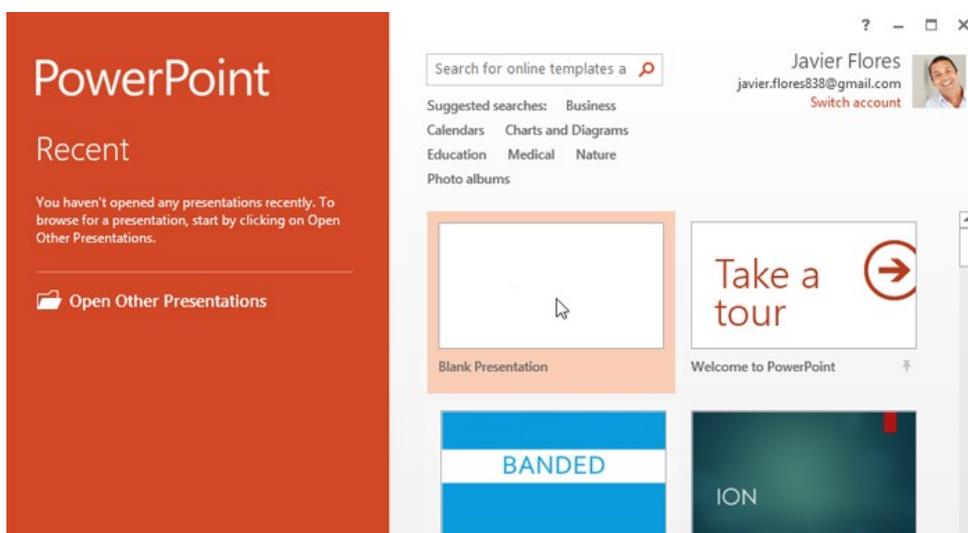
Command + K	Create a hyperlink
Command + N	Create a new page
Command + B	Bold
Command + I	Italic
Command + U	Underline
Command + C	Copy
Command + V	Paste
Command + Z	Undo
Command + S	Save
Command + P	Print
Command + O	Open
Command + A	Select All

CREATING PRESENTATION USING SLIDES

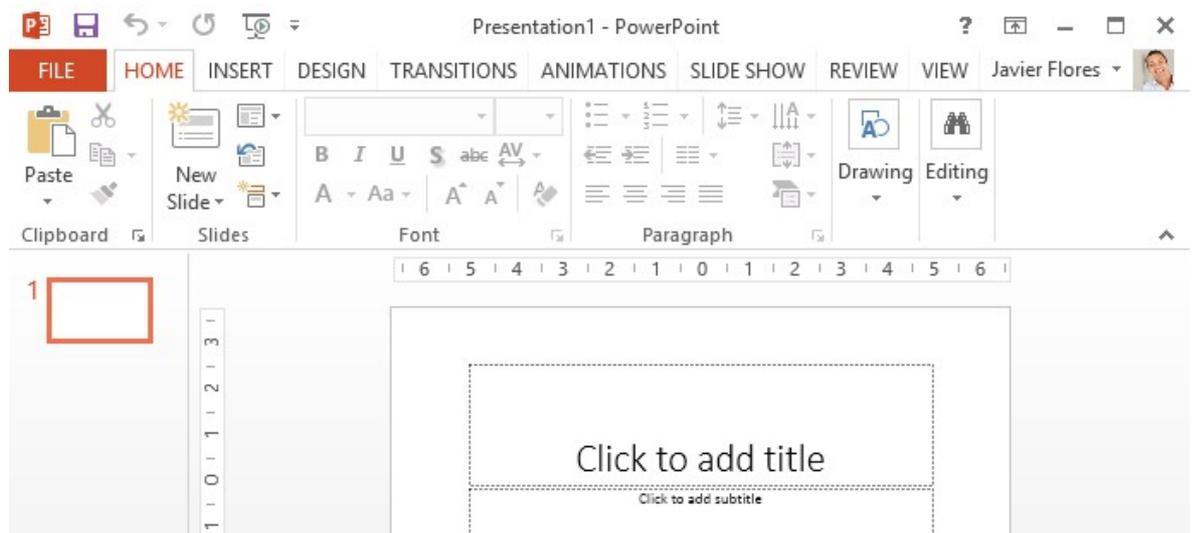
Opening PowerPoint 2013

When you open PowerPoint 2013 for the first time, the **Start Screen** will appear. From here, you'll be able to create a **new presentation**, choose a **template**, and access your **recently edited presentations**.

1. From the **Start Screen**, locate and select **Blank Presentation**.

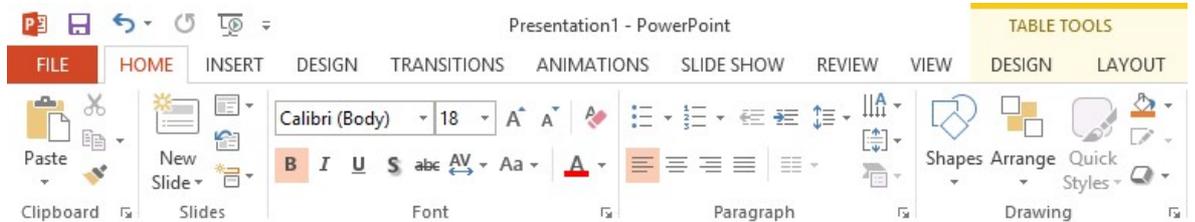


2. A new presentation will appear.

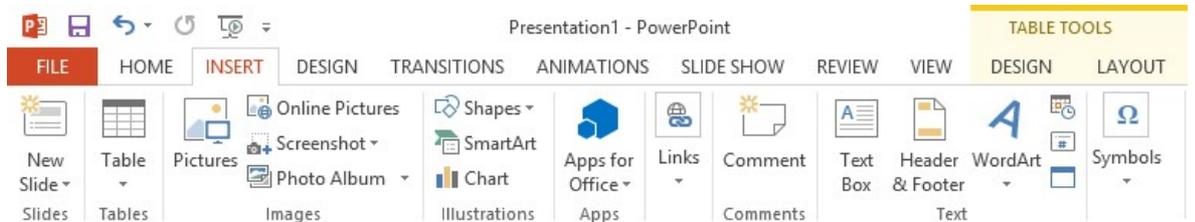


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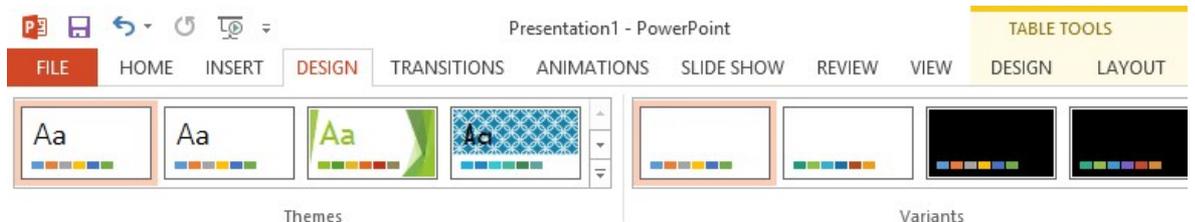
- The **Home** tab gives you access to the most commonly used commands, including **copy and paste, formatting, and the New Slide** command. The Home tab is selected by default whenever you open PowerPoint.



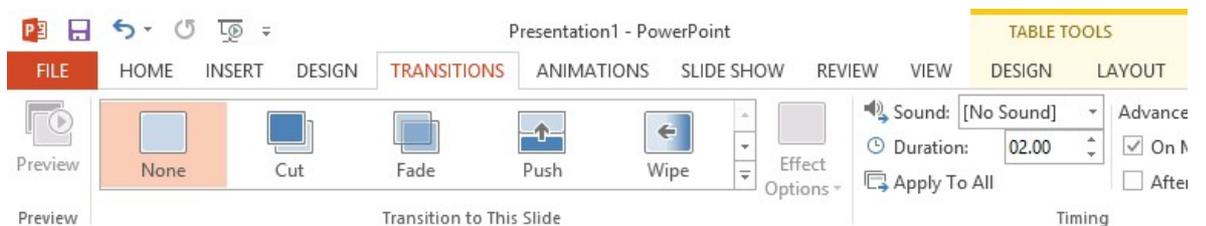
- The **Insert** tab allows you to insert **pictures, charts, tables, shapes, and videos**, which can help you communicate information **visually** and add **style** to your presentation.



- You can apply **themes** from the Design tab. A theme is a **predefined combination** of colors, fonts, and effects that can quickly change the look and feel of your entire slide show. Different themes also include different **slide layouts**

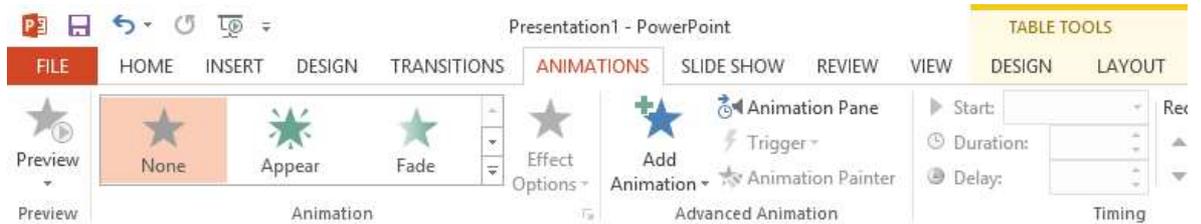


- You can apply slide transitions from the **Transitions** tab. Transitions are the movements you see between slides when presenting your slide show.

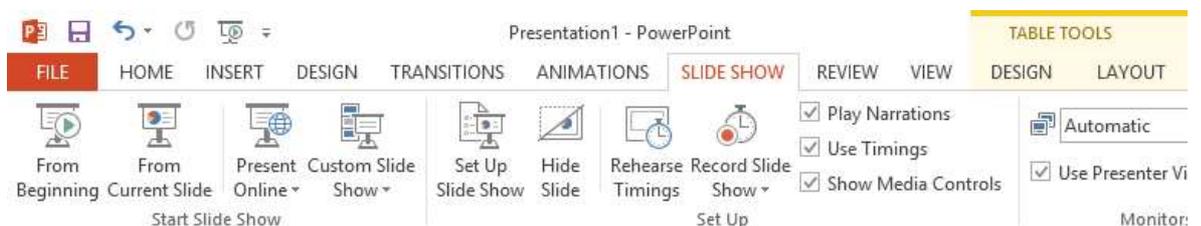


- The **Animations** tab allows you to **animate** text and objects such as clip art, shapes, and pictures. Animations can be used to draw attention to specific content or make the slide easier to read.

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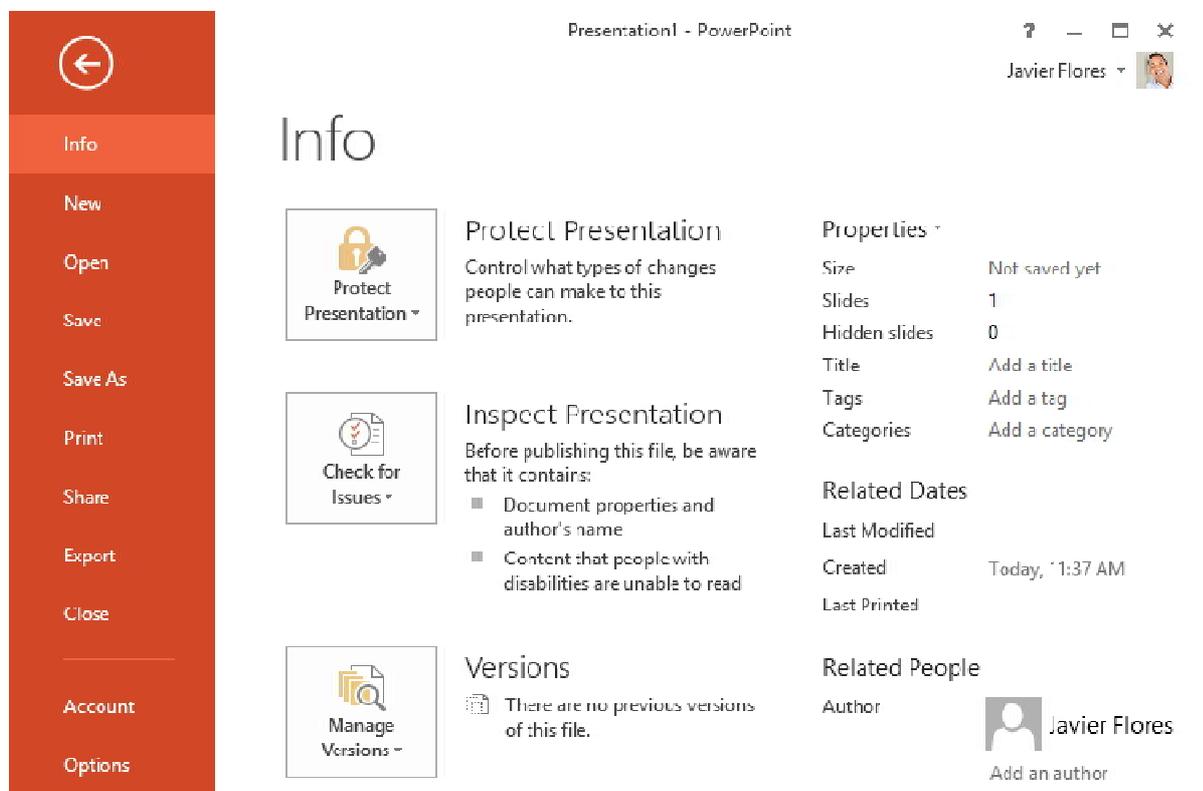
8. When you're ready to present your slide show, the **Slide Show** tab gives you tools to make your presentation smooth and professional, including the option to **rehearse timings and record narration**.



9. Backstage View

Backstage view gives you various options for saving, opening, printing, and sharing your presentations.

To access the backstage view, Click the File tab on the Ribbon.



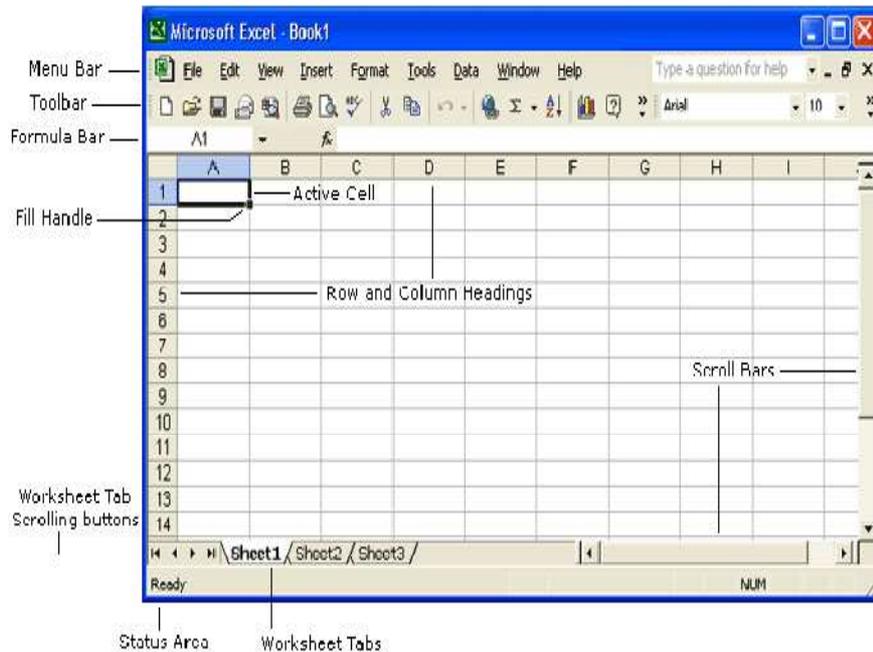
LECTURE 7: USE OF SPREADSHEETS FOR STATISTICAL ANALYSIS, EVALUATING MATHEMATICAL AND LOGICAL EXPRESSIONS

Spreadsheet is a software that helps to substitute the paper worksheets in the offices. Spreadsheet displays data in the form of rows and columns. An intersection of row and column is known as a cell.

MS-Excel is a window based spreadsheet developed by Microsoft corporation. It includes all features of a spreadsheet package like recalculation, graphs & functions. It also provides many Mathematical, Financial & Statistical functions. Thus it is used in many scientific and engineering environments for analyzing data. Excel can even hold graphic objects like pictures & images.

Some important features of MS-Excel:

1. **Window based application:** Excel like all other applications has Toolbars, Shortcut Menus, Auto correct, Online help and Wizards.
2. **Workbooks:** Workbooks are the files in which worksheets related to a project are held.
3. **OLE support:** Object linking and Embedding is a feature through which Excel can contain any object like a document, a picture etc.
4. **Maintaining high volume of data:** Excel can contain large volume of data. A worksheet can contain 65536 rows and 256 columns. A single cell can contain a maximum of 255 characters. One workbook can contain a maximum of 256 worksheets.
5. **Availability of functions:** Several Mathematical, financial & statistical functions are available in an Excel package.
6. **Availability of Charts & Graphs:** MS-Excel allows users to view data entered as tables in a graphical form as charts, which helps the user to easily understand, analyze data & compare data.
7. **Data Analysis Tools:** MS-Excel provides a set of data analysis tools called Analysis Tool pack.
8. **Sorting capability:** Excel has the capability of sorting any data in Ascending or Descending order.
9. **Auto fill feature:** Excel has the feature which allows to fill cells with repetitive data such as chronological dates or numbers and repeated text.

Components of the Excel window:

Rows, columns & cell: In a worksheet rows are numbered from top to bottom. The columns are labeled with letters from left to right. Rows are numbered from 1 to 65,536 and columns labeled from A to IV (256 columns).

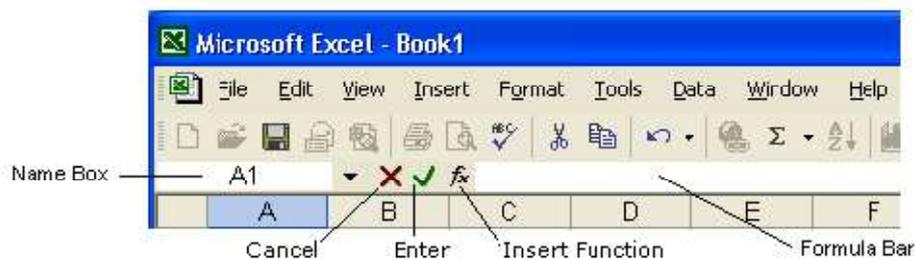
- **Title bar:** The title bar contains the name of the program Microsoft Excel and the default name of the workbook Book1 that would change as soon as you save your file and give another name.
- **Menu bar :** The Menu bar contains menus that include all the commands you need to use to work your way through Excel such as File, Edit, View, Insert, Format, Tools, Data, Window and Help.
- **Tool Bar:** Tool Bars are usually shortcuts for menu items. Standard and formatting toolbars are displayed by default.
- **Active cell:** The cell in which you are currently working.
- **Formula bar:** displays the contents of the active cell.
- **Name box:** displays the cell address of the active cell. Column letter followed by the row number. Ex: B6
- **Worksheet area:** The middle portion of screen which occupies a major area is called worksheet area. In this area, information or data (i.e.) either textual or numerical can be entered and the results can be displayed. A worksheet is a large work area of 65,536 rows and 256 columns.

• **Status bar:** located at the very bottom of the screen displays brief information about activating features within the worksheet area.

- **Sheet tabs:** appear above the status bar displaying the names of the worksheets.

Formula bar & Name box

The formula bar is located beneath the toolbar at the top of the Excel worksheet. Use the formula bar to enter and edit worksheet data. The contents of the active cell always appear in the formula bar. When you click the mouse in the formula bar, an X and a check mark appear. You can click the check icon to confirm and completes editing, or the X to abandon editing.



Formulas:

In Excel. One of the powerful features is formulas. A formula is an equation that is used to perform calculations on data in a worksheet. We can use formula to perform Mathematical, Statistical & date/time operations on a single value or a set of values by using operators.

The cells in which formulas are stored, display the result of the calculation and not the formula.

In Excel, a formula starts with an equal (=) sign and should be followed by the operation to be performed. We can use any number of operators in a single formula. MS- Excel evaluates the formula according to the order of precedence of the operators.

Operator	Operation	Order of precedence
()	Bracket	1
^	Exponentiation	2
*, /	Multiplication, Division	3
+ / -	Addition, Subtraction	4
&	Concatenation	5
= / > / <	Comparisons	6

Examples of the formula expressions:

1. Suppose the values in the cells B2, C2, D2 are 34, 28, 56 respectively. To add these values and to have the result in the cell F2,

Step i) Click on the cell in which total marks is to be displayed, i.e F2

ii) Type “ = (B2 + C2 + D2)”

iii) Press Enter

The value “118” will be displayed in F2.

2. Suppose the value of the cell B6 is 78345. Divide the value by 5 and have it in the cell E6:

Step i) Click the cell E6.

ii) Type “ = (B6/5) “

iii) Press Enter

The value “15669” will be displayed in the cell E6.

Functions :

A function is a built-in, readymade and frequently used formula that accepts data, perform calculations & returns results.

To enter a function in a cell,

i) Click the cell in which you want the result of the function to be displayed.

ii) Type “=” sign.

iii) Type the function name.

iv) Type the cell range & other arguments within brackets.

v) Press Enter.

Note : To specify a range of cells, a colon (:) is used between the first & last cell addresses.

Example: =Average(B1: B10)

Calculates the average of the values in the cells B1 to B10

Mathematical functions with syntax and purpose:

i) Sum(number1, number2,...) – gives the sum of the values in a specified range

ii) Abs(number) - gives the absolute value of the number

iii) Fact(number) - gives the factorial of the number

iv) Sqrt(number) - gives the square root of the number

v) Log(number) - gives the logarithm of the number

Statistical functions with syntax and purpose:

i) Average(range of cells) - calculates the average of the values in a specified range

ii) Stdev(range of cells) - calculates the standard deviation of the given data

iii) Mean(range of cells) - calculates the mean of the given data

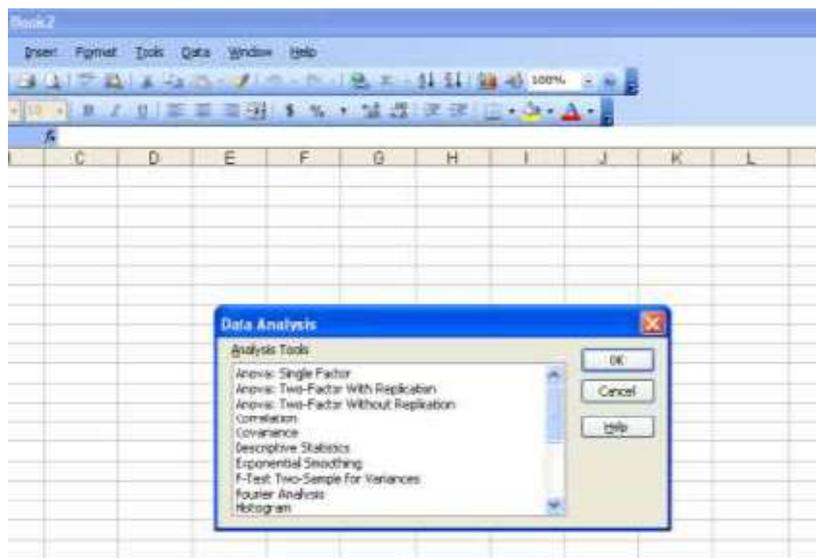
iv) Max(range of cells) - gives the maximum value within the range specified

v) count() - counts how many numbers are there in the list of arguments

Statistical Analysis Tools

Microsoft Excel provides a set of data analysis tools— called the Analysis Tool Pak— that you can use to save steps when you develop complex statistical or engineering analyses. You provide the data and parameters for each analysis; the tool uses the appropriate statistical or engineering macro functions and then displays the results in an output table. Some tools generate charts in addition to output tables. Related to worksheet functions, Excel provides many other statistical, financial, and engineering worksheet functions. Some of the statistical functions are built-in and others become available when you install the Analysis Tool Pak.

Accessing the data analysis tools: The Analysis Tool Pak includes the tools described below. To access these tools, click Data Analysis on the Tools menu. If the Data Analysis command is not available, you need to load the Analysis Tool Pak [add-in](#) program.



Analysis Tools:

ANOVA: Single factor

ANOVA: Two-Factor with replication

ANOVA: Two-Factor without replication

Correlation

Covariance

Descriptive statistics

F-test two-sample for variances

Histogram

Regression

t-test: two sample assuming equal variances

t-test: two sample assuming unequal variances

Z-test: two sample for means

Steps to use Analysis Tools:

Step i) From the Menu bar choose Tools and click on Data Analysis

ii) When the Data Analysis dialogue box appears, click on the one you want.

iii) The corresponding dialogue box appears. Enter the Input range and Output range (addresses of the cells)

iv) give the address of the cell where you want the result to be shown.

iv) click OK

v) The result will be given in the corresponding output format.

LECTURE 8: USE OF SPREADSHEETS FOR INTERPRETATION AND GRAPH CREATION

Creating Charts :

Charts in Excel are used to represent data pictorially. We can use different types of charts to represent data.

Types of charts which are available in Excel:

1. Column charts
2. Bar charts
3. Line
4. pie
5. XY (scatter)
6. Area
7. Doughnut
8. Radar
9. Surface
10. Bubble
11. Stock
12. Cylinder, Cone & Pyramid

Creating a Chart :

Step i) Enter the data in a table.

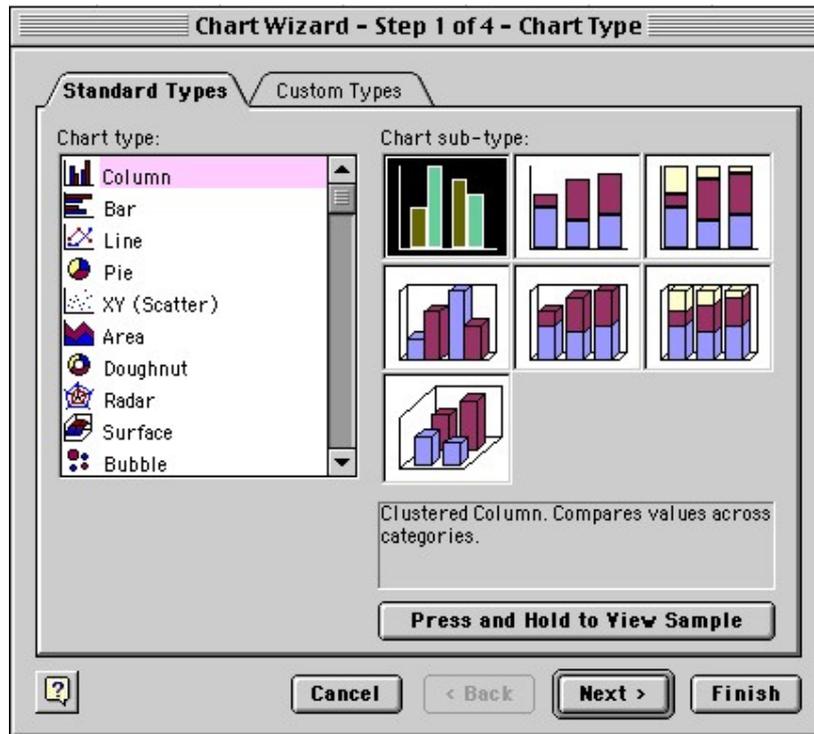
ii) Open the Insert Menu and select Chart

iii) In the Chart Wizard – Step 1 of 4, select the type of chart you want to make and click Next

iv) In the step 2 of 4, enter chart source data and click Next

vi) In the step 3 of 4, enter the chart options like label of the chart and click Next

vii) In the step 4 of 4, give the chart location where you want the chart to be located and press Finish.



Column Chart: Column charts are one of the most common types of graphs used to display data. A column chart represents data in the form of a series of vertical bars. Each bar represents a value.

For example, to draw a column chart for the production of different crops in a region:

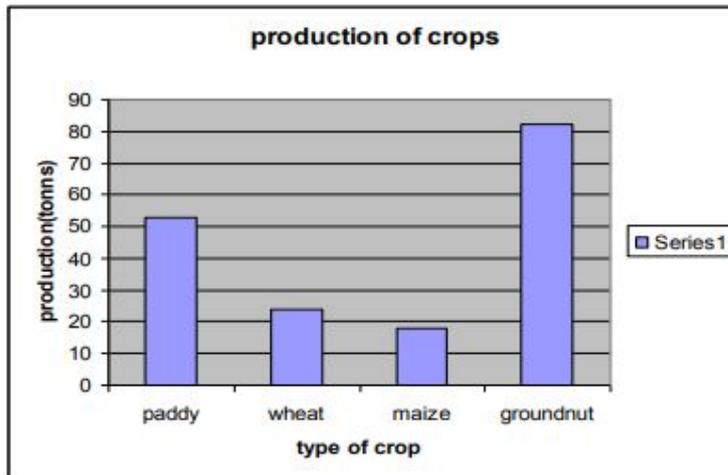
S.No.	A	B
	crop	Production(tons)
1	Paddy	53
2	Wheat	24
3	Maize	18
4	Groundnut	82

To construct a bar chart for the above data:

- Step i) Enter the data in a table.
- ii) Open the Insert Menu and select Chart
- iii) In the Chart Wizard – Step 1 of 4, select Column chart and click Next
- iv) In the step 2 of 4, enter chart source data
- v) In the step 3 of 4, enter the chart options like label of the chart

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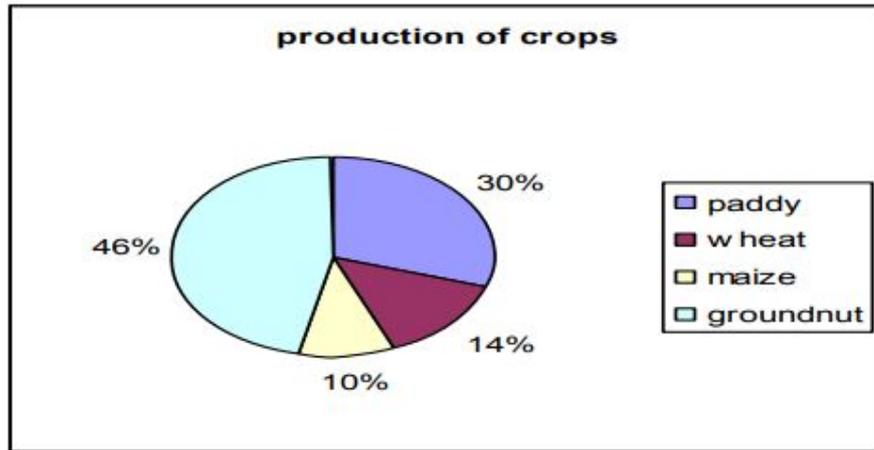
vi) In the step 4 of 4, give the chart location where you want the chart to be located and press Finish.



Pie Chart: A Pie chart is used to represent the distribution of a categorical data. In this chart, a circle is divided into sectors, whose area are proportional to the frequencies or percentages of cases under various categories. Data on each variable is entered in the Excel worksheet in a row or column with suitable headings. Then we select the data of the first series and choose pie chart and proceed as per the options given in the dialogue box. A separate chart pie chart should be drawn for each data set. For example, to draw a pie chart for the production of different crops in a region:

For example, to draw a pie chart for the production of different crops in a region:

S.No.	A	B
	crop	Production(tons)
1	Paddy	53
2	Wheat	24
3	Maize	18
4	Groundnut	82



LECTURE 9: Database- concept and types, uses of DBMS/RDBMS in agriculture.

Data:

It is a collection of information.

The facts that can be recorded and which have implicit meaning known as 'data'.

Example:

Customer -----

- 1.cname.
- 2.cno.
- 3.ccity.

Database:

- It is a collection of interrelated data.
- These can be stored in the form of tables.
- A database can be of any size and varying complexity.
- A database may be generated and manipulated manually or it may be computerized.

Example:

Customer database consists the fields as cname, cno, and ccity

Cname	Cno	C city

Database System:

It is computerized system, whose overall purpose is to maintain the information and to make that the information is available on demand.

Advantages:

- 1.Redundency can be reduced.
- 2.Inconsistency can be avoided.
- 3.Data can be shared.
- 4.Standards can be enforced.
- 5.Security restrictions can be applied.
- 6.Integrity can be maintained.
- 7.Data gathering can be possible.
- 8.Requirements can be balanced

Database Management System (DBMS):

- It is a collection of programs that enables user to create and maintain a database.
- In other words it is general-purpose software that provides the users with the processes of defining, constructing and manipulating the database for various applications.
- All of the **organized sets of information** with some kind of an **indexing system** which facilitates **access** to and **search** for specific information (eg. indexing systems for files, papers/letters; table of contents in a book; the alphabetical order of arrangement of words in dictionary; the alphabetical order and classification system in a telephone directory; subject or author based classification of reference cards by individual scientists; the classification of books in library; the coding systems used by scientists for storing and retrieving samples; etc.).

Definition: Database management systems (DBMS) are computerized systems for organizing, storing, retrieving, updating and analyzing large and related data quickly and efficiently to provide useful information for decision-making for specific purposes and situations.

Disadvantages in File Processing

- Data redundancy and inconsistency.
- Difficult in accessing data.
- Data isolation.
- Data integrity.
- Concurrent access is not possible.
- Security Problems.

Advantages of DBMS:

- Data Independence.
- Efficient Data Access.
- Data Integrity and security.
- Data administration.
- Concurrent access and Crash recovery.
- Reduced Application Development Time.

Applications

- Database Applications:
- Banking: all transactions
- Airlines: reservations, schedules
- Universities: registration, grades
- Sales: customers, products, purchases

- Online retailers: order tracking, customized recommendations
- Manufacturing: production, inventory, orders, supply chain
- Human resources: employee records, salaries, tax deductions.

Relevance to agricultural research/ Uses of DBMS/RDBMS in Agriculture

- Data are valuable resources in agricultural research.
- They are generated at considerable expense.
- Much of the agricultural research data is generated over several seasons through multidisciplinary and multilocational research, and needs to be stored and managed efficiently.
- Field research, even at the individual level, involves recording data in a number of experimental plots or farmers' fields and over several seasons.
- DBMS enable such research data to be organized and managed efficiently both at the individual and multiuser level for purposes of analysis, decision-making and presentations..
- Further, the users of the research data can be diverse and not limited to those who generated the data. Researchers like those involved in developing simulation models for decision support, technology transfer or in designing agricultural policy and development programmes often use data generated from others' research to save on time and costs.
- For such users, and also for individual researchers DBMS help to:
 - separate data from applications (the need to do this is becoming more and more important in modern research when data have to be shared between diverse users and applications)
 - avoid unnecessary duplication of data
 - perform two basic functions – reading and editing – on the data routinely and consistently. Both require systematic and consistent identification of the data. This can be difficult without a DBMS when data are large and complex
 - when data are large and complex they need to be carefully structured to identify specific data and eliminate redundancy and inconsistency in the databases. Database management systems permit this.

Database management concepts are central to the newer tools of agricultural research like GIS (in natural resources management research), and bioinformatics (in plant and animal science research).

Some example areas of agricultural research and policy where databases are useful because of the large variety and complexity of data are:

- Administration and management
- Planning and policy
- Natural resources management
- Managing coordinated projects
- Genetic resources classification

- Experimental station management
- Bioinformatics/genomics/proteomics

Data Representation in Database

The most familiar way of representing data about **entities** (distinguishable real world objects with common properties; examples of entities are students, employees, states, districts, farmers, field plots, fertilizers, rainfall, etc.) is in the form of **Tables or data files**.

Tables are two-dimensional structures consisting of columns and rows. The columns are called **Fields** and the rows are called **records** in database terminology. Thus, in a Table, data are stored in fields and records.

A **Field** is the basic unit of representing information about an entity. Each field refers to one attribute or property of the entity. For example, 'name' is a field or attribute of entity employee in an employee table or data file; 'age' is another such attribute for the same entity; temperature and rainfall are fields/attributes of the entity weather in a weather table or data file; plot no., dates of sowing are fields/attributes of the entity, experimental plot data file; district name, area, etc are data fields corresponding to the entity districts in a districts table or data file and so on.

Records are actual data (text, numbers, dates, etc.) for each attribute/field in the Table. Each record is one set of attribute data, that is, the data of all fields for one entity (eg. text, numbers, dates, etc. representing say name, age, date of birth, etc. for any one employee in the employees data file, or soil type, texture, available water capacity etc., in soils data file, district number, name and area in a districts data file, etc.)

Table of Districts

District	Area ('000 ha)	Population (000)
Aaaa	2000	25000
Bbbb	3000	23578
Cccc	1500	15789

FIELDS

Number of fields = number of columns

RECORD

Number of records = number of rows of data

Types of Database Management Systems

Over the years, to satisfy the needs of data storage, processing and retrieval, database models of varying degrees of sophistication were devised. Large enterprises needed to build many independent data files containing related and even overlapping data, often in quite different formats to fulfill

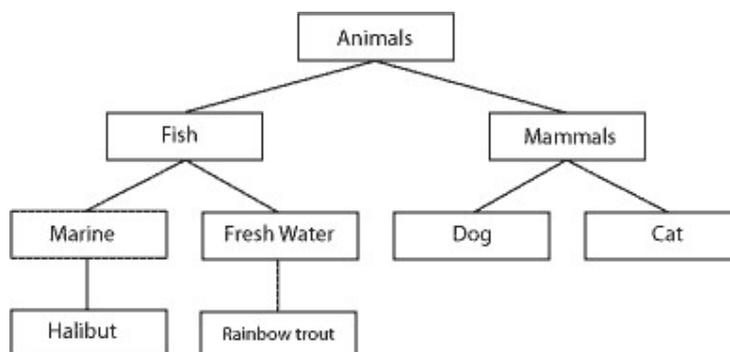
different purposes. Data-processing activities frequently required the linking of data from several files necessitating designing data structures and database management systems that supported the automatic linkage of files. Four database models and their corresponding management programs were developed to support the linkage of records of these types. The following database models and their management systems are in common use:

1. Hierarchical databases.
2. Network databases.
3. Relational databases.
4. Object-oriented databases

1. Hierarchical Database Management System:

A hierarchical database is a one in which the data elements have a one-to-many relationship (1:N). The schema for a hierarchy has a single root. This kind of database model uses a tree-like structure which links a number of dissimilar elements to one primary record – the "owner" or "parent". Each record in a hierarchical database contains information about a group of parent child relationships. The data are stored as records, each of which is a collection of fields containing only one value. The records are connected to each other through links. The structure implies that a record can have a data element repeated. Hierarchical models make the most sense where the primary focus of information gathering is on a concrete hierarchy such as a list of business departments, assets or people that will all be associated with specific higher-level primary data elements. They are very simple and fast. In the hierarchical database model the user must have some prior information about the database. Hierarchical databases were popular in early database design, in the era of mainframe computers.

The idea behind hierarchical database models is useful for a certain type of data storage, but it is not extremely versatile. They are confined to some very specific uses. For example, where each individual person in a company may report to a given department, the department can be used as a parent record and the individual employees will represent secondary records, each of which links back to that one parent record in a hierarchical structure.



Example of a hierarchical database model

These databases allow easy addition and deletion of records. These databases are good for hierarchies

Advantage: Hierarchical databases relate well to anything that works through a one-to-many relationship. They can be accessed and updated rapidly because in this model, the data structure is like that of a tree, and the relationships between records are defined in advance.

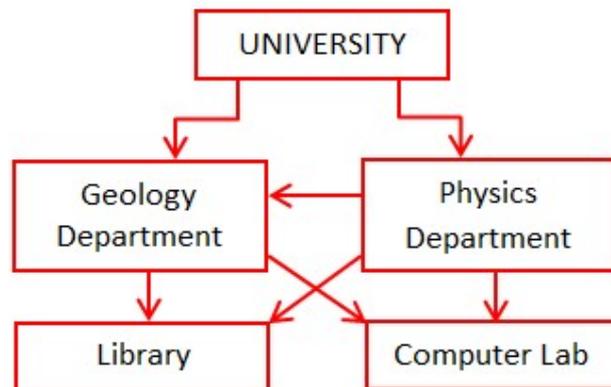
such as employees in an organization or an inventory of plant specimen in a museum. Data at the top of the hierarchy is accessed with great speed.

Disadvantage: This type of database structure permits each child a relationship with only one parent, and relationships or linkages between children are not permitted, even if they make sense from a logical standpoint. This limitation is circumvented by a repetition of data, which adds to the size of the database. Searching for specific data requires the DBMS to run through the entire data from top to bottom until the required information is found, making queries very slow. The lower the required data in the hierarchy, the longer it takes to retrieve it. Adding a new field or record requires the entire database to be redefined.

2. Network Database

Management System:

A network database model is one in which multiple member records or files are linked to multiple owner files and vice versa. The network database model can be viewed as a net-like form where a single element can point to multiple data elements and can itself be pointed to by multiple data elements.



Example of a network database model

The network database model allows each record to have multiple parents as well as multiple child records, which can be visualized as a web-like structure of networked records. By contrast, in the hierarchical model, a data member can only have many child records, but only a single parent record.

Actually, the network model is quite similar to the hierarchical model – the hierarchical model being a subset of the network model. However, instead of using a single-parent tree hierarchy, the network model uses set theory to provide a tree-like hierarchy with the exception that child tables are allowed to have more than one parent. It supports many-to-many relationships and can be visualized as a cobweb or interconnected network of records

Advantages: A Network database is conceptually simple and easy to design. The data access is easier and more flexible as compared to a hierarchical model. It does not allow a member to exist without a parent. The main advantage of a network database is that it can handle more complex data because of its many-to-many relationship. It allows for a more natural modeling of relationships between records or entities, as opposed to the hierarchical model. Because of its flexibility, it is easier to navigate and

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search for information in a network database. This kind of database structure isolates the management programs from the complex physical data storage details.

Disadvantages: The main disadvantage is that all the records in the database need to be maintained using pointers, making the whole database structure very complex. The insertion, deletion and updating operations of any record require an adjustment of a large number of pointers. Network databases are difficult to use by first time users. Structural changes to the database are very difficult to implement. Difficulties are encountered while making alterations to the database because entering new data may necessitate altering the entire database.

3. Relational Databases

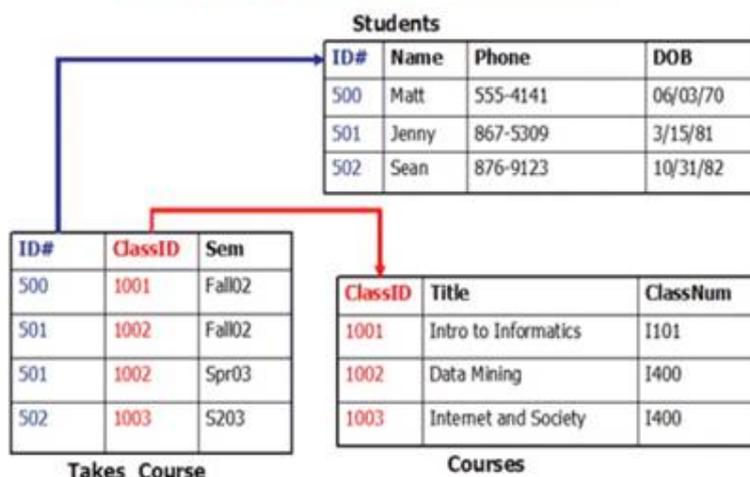
Management System:

A relational database is one in which data is stored in the form of tables, using rows and columns. This arrangement makes it easy to locate and access specific data within the database. It is “relational” because the data within each table are related to each other. Tables may also be related to other tables. In relational databases, tables or files

containing data are called *relations* (tuples), and are defined by rows (or *records*), and columns (or *attributes*) referred to as fields. Each table has a key field that mainly identifies each record (row), and on the basis of which records in different tables are related (or linked).

This kind of a relational structure makes it possible to run queries that need to retrieve data from multiple tables simultaneously. An RDBMS may also provide a visual representation of the data. For example, it may display data in a spreadsheet-like table, allowing you to view and even edit individual data elements in the table. Some RDMBS programs allow you to create forms that can streamline entering, editing, and deleting data. Most well-known database management systems fall into the RDBMS category. Examples include Oracle Database, MySQL, Microsoft SQL Server, and IBM DB2. Some of these programs support non-relational databases, but they are primarily used for relational database management.

Relational DBMS



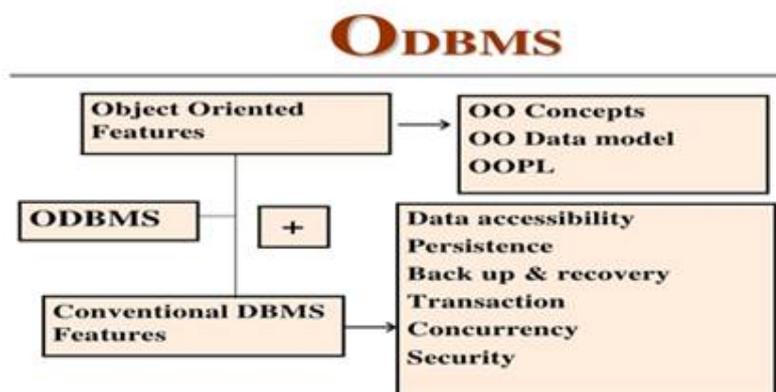
Example of a relational database model

Currently, the relational database approach is the most popular. The older hierarchical data management systems are being replaced by relational database management. Relational DBMS software is available for large mainframe systems as well as workstations and personal computers. The need for more powerful and flexible data models to support scientific and business applications has led to extended relational data models in which table entries are no longer simple values but can be programs, text, unstructured data in the form of large binary, or in any other format which the end user needs.

Advantages: Any data organized as tables consisting of rows and columns is much easier to understand. Data can be stored in separate tables or files containing logically related attributes, so that huge amounts of data are segmented, making management and retrieval easier and faster. Different tables from which information has to be linked and extracted can be easily managed. Security and authorization control can also be implemented more easily by moving sensitive data in a given database to a separate relation with its own authorization controls. Data independence is easily achieved in a relational database than in the more complicated tree or network structure. Redundancy and replication of data can be minimized. RDBMS offers the possibility of responding to queries by means of a language based on relational algebra and relational calculus. It offers logical database independence i.e. data can be viewed in different ways by the different users. Multiple users can access the database simultaneously which is not possible in other kinds of databases. RDBMS also offers better backup and recovery options.

Disadvantages: A major constraint, and therefore disadvantage of RDBMS is its reliance on machine performance. If the number of tables between which relationships are to be established is large, then the performance in responding to the SQL queries is affected. The required hardware is complex and software expensive, increasing the overall cost of implementing RDBMS.

4. Object-Oriented Database Management System:



Example of an object oriented database model

A recent development in database technology is the incorporation of the object concept that has become significant in programming languages. In object-oriented databases, all data are objects. Objects may be linked to each other by an “is-part-of” relationship to represent larger, composite objects. For example, the data describing a truck may be stored as a composite of a particular engine, chassis, gear box, steering system, etc. Classes of objects may form a hierarchy in which individual objects may inherit properties from objects higher up in the hierarchy. For example, objects of the class “motorized vehicle” will all have an engine (a truck, a car or an airplane). Likewise, engines are also data objects, and the engine attribute of a particular vehicle will be a link to a specific engine object. Multimedia databases, in which voice, music, and video are stored along with the traditional textual information, provide a justification for viewing data as objects. Such object oriented databases are becoming increasingly important, since their structure is most flexible and adaptable. The same is true of databases of pictures, images, photographs or maps. The future of database technology is generally perceived to be an integration of the relational and object-oriented database models.

Advantages: Object oriented databases combine the object oriented principle with the database management principle to give a hybrid system that is more powerful than the conventional relational database management system. The principles of object orientation like consistency, isolation, durability, and atomicity are supported along with the principles of database systems. In OODBMS, working with objects in the programming language is similar to working with objects in the database. Each object in the database is identified by an object identifier called the OID which is generated by the system. The OODBMS is more powerful than the RDBMS if you are used to object oriented programming. Another advantage of using the OODBMS is that when your application requests for an object, it is sent by the database to the memory, and you work with the in-memory object. Any update or deletion is done to the in-memory object and these changes can later be saved to the database. This helps to avoid the frequent access to the database while updating, deleting, etc.

Disadvantages: A significant disadvantage of OODBMS is that it lacks a theoretical foundation which makes it comparable to pre-relational systems. The use of OODBMS is relatively limited because we do not yet have the level of experience that we have with traditional systems. There is reluctance to the acceptance of this technology because OODBMSs are still very much geared towards the programmer, rather than the naïve end-user. While the OODBMS is limited to a small niche market, this problem will continue to exist. The increased functionality provided by the OODBMS makes the system more complex than the traditional DBMSs. Currently, OODBMSs do not provide adequate security mechanisms – the database manager cannot grant access rights on individual objects or classes.

LECTURE 10: Database Design, Creation

Database Structure/ Database Design:

Relational databases follow well defined rules of structure to maintain data integrity. If the structure design is good, it allows easy modifications and data retrieval, and minimizes scope for data entry errors. Crucial to good design of database structure are the determination of :

- Tables and keys
- Relationships between the tables, and
- Integrity rules which determine the consistency and efficiency of the database.

Tables and Keys

The first step in creating the database structure is to develop a list of all the data fields required for the database and group them into different tables by themes. The grouping should allow identification of the Primary and Related Tables. The tables can be **related** if they have a **common field**.

Relating Tables in a database (example 1): Employee data

ID	Name	Division	Designation
1001	Aaaa	Agronomy	Asoc Professor
1002	Bbbb	Genetics	Professor
1003	Cccc	Engineering	Asst.Professor

Table 1-Base data
(service book)

No.	ID	Month	Basic	HRA	DA
1	1001	January	10000	1500	4000
2	1001	February	10000	1500	4000
3	1002	January	8000	1200	3200
4	1002	February	8000	1200	3200

Table 2 Pay data

In the above example, the two tables Table 1 (primary table) and Table 2 (related table) have a common field ID (Identification number of employee). Records in the two Tables can therefore be connected via this common field. Once connected/related, the two tables can be used to prepare a pay slip for an employee in any month. The pay related data for each employee are drawn from Table 2 and the details of the corresponding employee can be drawn from Table 1 using the common field (ID)

Note that in Table 1, the identification number of each employee (ID, First column) is unique to distinguish one employee from another. The data in other fields need not be unique. For example, names of employees can be same for more than one employee and so can the other fields. Each row of data can be located and identified using the ID field. Each table entry contains only a single value. The order of the rows and columns is not important. They can be viewed or added in any order. The field ID. is called the **Primary Key** of the Table. In Table 2, records can be uniquely identified by a single field only when the serial number column (No., First column) is included in the table. So, in this table the field NO. is the primary key. The field ID in Table 2 (which is the common field with Table 1) is called the **Foreign Key**.

Primary Key and Foreign Key

Primary key is a Field (attribute/column) that uniquely identifies each record in the table

NOTE:

- Choice of primary key is usually obvious from the structure of the Table.
- If there is no easy natural choice for a primary key add a column containing a unique identifier (serial number)
- Data in every column of the row must be dependent on the primary key

Foreign key is the Field in the related Table that is common with the Primary key in the primary table.

The primary key and the foreign key connect the primary and related Tables.

Relationships

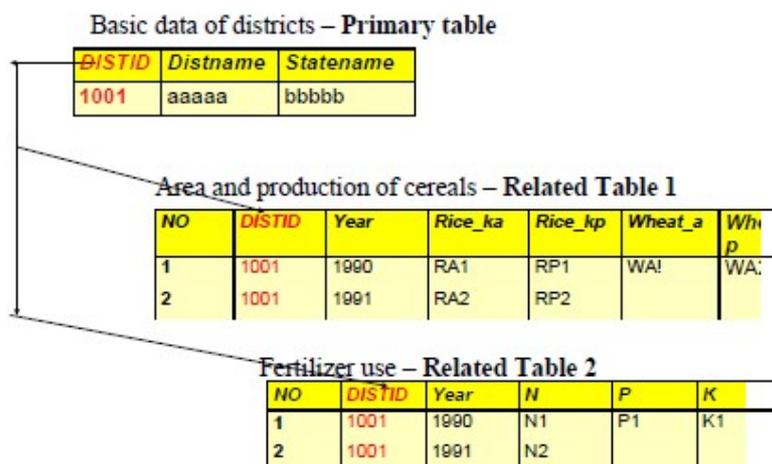
In the above example, in the primary table (Table 1), for every data value in the primary key field (ID) there are several values in the Related Table (Table 2) in the foreign or common key field (ID). The two Tables are said to have a **one-to-many relationship**.

Types of Relationships

A Relationship is created between two tables by creating a **join** between them through the common field. Records between two tables are then connected through the common field. Creating the relationship allows viewing and extracting data from the two different tables as if they were from one large table.

- (i) A one-to-many relationship exists between two tables when one record in the primary table matches zero, one or many records in the related table.
- (ii) Many-to-many relationships can also occur. In such relationships, each record in the primary table can have many matching records in the related table and one record in the related table has many matching records in the primary table.

Similarly in the districts database in the following example, DISTID is the primary key in the primary table and the serial number field (NO) is the primary key in the two related tables. DISTID is the foreign key in the related tables. The primary and the related tables 1 and 2 are related by a one-to-many relationship. The three tables can be used to relate the cereals production and fertilizer use in any district and year as the field DISTID is common between them.



Database integrity

In a relational database, **integrity** must be maintained between data in the primary and related tables. This implies that:

- (i) There cannot be any values in the foreign key field of the related table, corresponding values for which do not exist in the primary table.
- (ii) Any editorial changes to the data values in the primary key field of the primary table must be automatically reflected in the corresponding data values in the foreign key field of

the related table. The user should not have to reopen each related table to make the required changes in the foreign key field.

- (iii) If one record is deleted from the primary table, then all the records in the related tables with corresponding data in the foreign key field should be deleted automatically.

All of these essentially mean that there must be consistency between data in the primary and related tables to maintain valid relationships. For such consistency the data must follow specific rules called data integrity rules.

Database Integrity Rules

- (i) in all tables the primary key must be unique and that there should be no null values in this field. (primary key integrity)
- (ii) each non-null foreign key value in the related table must match a corresponding primary key value in the primary table (referential integrity)
- (iii) the data types of primary and foreign key in a the primary and related tables must match perfectly (domain integrity).

Designing the database structure – summary of steps

- Identify all relevant entities (Tables) and attributes of each entity (fields) required to produce the needed information
- Group related fields into tables (one table for one theme or set of related fields)
- Determine the relationships between the tables. (primary and related tables)
- Determine the properties of each field (field name, data type, description, etc.)
- Determine the primary key of each table - unique identifier for a row
- Include a common field with the primary table in the related tables
- Avoid data redundancy in all tables:
 - No table must have duplicate rows or columns
 - No duplication of data between tables
 - No derived or calculated data fields
 - Eliminate columns that do not depend on the primary key
 - Create new tables if necessary
- Identify the common field between the Primary and related tables. This is usually the primary key in the Primary Table. The same (common) field in the related table is called the **Foreign key**
- Ensure that the data types of the primary and foreign key are the same.
- Connect the tables by joining the primary key from primary table with foreign key of related table to create relationships.

- Add data to tables

Creation of Database

MS Access is an object-oriented programme; that is everything in Access is an object, including the database application itself. All objects of the database are stored in a single data file, and the filename has an .MDB extension. The objects are managed through a Database window. An important feature of Access is that it comes with several database wizards. These are mini programmes that interact with the user about his needs for creating different objects, and then create the database structures that match them. The user only needs to choose among a range of options and enter the actual data. Excellent help are also features available in MS Access for users to learn and deploy the various functions. Because of such user-friendly tools for designing each object, Access is an appropriate database management tool for both novices and professionals.

The first step in developing a DBMS using Access is the creation of the database file. This file contains all the data in the form of several tables. It also contains files for customized data entry forms, reports and queries that constitute the database application. Thus a database file in Access contains files which can be: Tables, Forms, Queries or Reports

- 1. Tables** are the core primary building blocks of a database. A Table is very much like a data table or spreadsheet containing rows (records) arranged in different columns (fields). At the intersection of field and a row is the individual bit of data for a particular record, called a cell. Each database file can have many tables. Each Table is collection of similar data. All the data entered into a database end up in a Table for storage. The specific Tables into which the data will be organized needs to be planned carefully and frequent changes in their form and structure should be avoided. Information can be entered directly into each Table, but this may prove cumbersome if there are too many columns and rows. In such case forms are used to enter data by records.
- 2. Forms** are a more convenient means of data entry and viewing. In Access, a fill-in-the-blanks kind a form (similar to an application form) can be created to simplify data entry. Data entered in a Form gets stored in a specified row in a Table, as Access automatically links them. One convenient feature is that separate forms need not be created for filling each Table. A single form can be used to enter data into several Tables at the same time. It can therefore serve as link between Tables. Forms are designed to be used on screen for data entry based on the needs and some flexibility in their changes is possible, but it is better to plan them in advance.
- 3. Queries** are questions that users ask of the data stored in the Tables to obtain information. They facilitate seeing data from several Tables simultaneously. They

also facilitate seeing only that part of the data in the Tables that is desired at a particular time by filtering out the data that may not be needed.

4. **Reports** are designed to be printed. They are specially formatted collections of data, organized in a specified way to summarize the data. A report can extract data from many Tables, perform simple calculations on the data and present results in a neat format. Reports can be created at any time. They need not always be planned beforehand.

Tables, forms, reports and queries are created in separate steps, but they are related. Tables are the core of the DBMS, with the others having to do with entering, extracting or presenting the data in the Tables.

Multiple Tables can be created in Access to reduce redundancy in a database. By creating Forms, Queries and Reports, data can be extracted from more than one Table easily. This can be done best when there is a well-defined relationship between the Tables. When two Tables have a common field they can be related.

MS-ACCESS Data Types:

Here are some of the most common data types you will find used in a typical Microsoft Access database.

Type of Data	Description	Size
Short Text	Text or combinations of text and numbers, including numbers that do not require calculating (e.g. phone numbers).	Up to 255 characters.
Long Text	Lengthy text or combinations of text and numbers.	Up to 63, 999 characters.
Number	Numeric data used in mathematical calculations.	1, 2, 4, or 8 bytes (16 bytes if set to Replication ID).
Date/Time	Date and time values for the years 100 through 9999.	8 bytes
Currency	Currency values and numeric data used in mathematical calculations involving data with one to four decimal places.	8 bytes
AutoNumber	A unique sequential (incremented by 1) number or	4 bytes (16 bytes if set to

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	random number assigned by Microsoft Access whenever a new record is added to a table.	Replication ID).
Yes/No	Yes and No values and fields that contain only one of two values (Yes/No, True/False, or On/Off).	1 bit.

LECTURE 11: Internet and World Wide Web (WWW), concepts, components and creation of Web, HTML, XML and coding.

Internet

- Network of interconnected computers around the world.
- A network of computer networks which operates world-wide using a common set of communications protocols.
- A computer network consisting of a worldwide network of computer networks that use the TCP/IP network protocols to facilitate data transmission and exchange.
- Visualization of the various routes through a portion of the Internet

What do we need to get connected to internet?/Components of Internet:

Getting on the Internet requires:

- ❖ Computer
- ❖ Modem
- ❖ Telephone Line
- ❖ Internet Service Provider (ISP)
- ❖ Communication Software
- ❖ **Distinguish between Modem and Telephone Line**

Modem	Telephone line
Modem is a communications device that allows us to communicate with another computer through telephone lines. Modem is a communications device that allows us to communicate with another computer through telephone lines.	Telephone services, such as – ISDN, – 56K leased lines, and – T-1 connections
Modem is abbreviation of modulator/demodulator.	offer connections to the Internet at considerably faster connection speeds.

✓ **Internet Service Provider (ISP)**

- An Internet Service Provider (ISP) is a company that allow you to use their internet connection for a price.
- When you register with an ISP the followings are given:

Username : A unique name that identifies you.

Password : A secret code that prevents other people from using your account.

Some Popular Internet Service Providers

- AT&T WorldNet
- Microsoft Network
- America Online
- In India:
 - VSNL (Videsh Sanchar Nigam Limited)
 - MTNL (Mahanagar Telecom Nigam Limited)
 - BSNL (Bharat Sanchar Nigam Limited)
 - Satyam Online

✓ Communication Software

Computer needs communicate on software to allow you to get connected to, and interact with, the Internet.

Communication software is of two types:

- Software that Helps Establish Basic Internet Connectivity
- Software that helps to browse, access e-mail etc.

World Wide Web

"The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge." Tim Berners-Lee, a scientist at CERN (The European Organization for Nuclear Research (French: Organisation Européenne pour la Recherche Nucléaire), invented the World Wide Web (WWW) in 1989.

- The Web was originally conceived and developed to meet the demand for automatic information sharing between scientists working in different universities and institutes all over the world.
- The basic idea of the WWW was to merge the technologies of personal computers, computer networking and hypertext into a powerful and easy to use global information system.
- The World Wide Web, abbreviated as WWW and commonly known as The Web, is a system of interlinked hypertext documents contained on the Internet.
- With a web browser, one can view web pages that may contain text, images, videos, and other multimedia and navigate between them by using hyperlinks.

✓ Hypertext

- Hypertext is text displayed on a computer or other electronic device with references (hyperlinks) to other text that the reader can immediately access, usually by a mouse click or keypress sequence.
- Apart from running text, hypertext may contain tables, images and other presentational devices. Hypertext is the underlying concept defining the structure of the World Wide Web, making it an easy-to-use and flexible format to share information over the Internet.

✓ Web Browser

• A web browser is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Locator (URL) and may be a web page, image, video, or other piece of content.

• Example of Web Browser:

Mosaic

Internet Explorer

Netscape Navigator

Mozilla Firefox

✓ Web Page and Websites

• W3 contains several millions of pages of information. Each of these pages is called a Web Page.

• A webpage or web page is a document or resource of information that is suitable for the World Wide Web and can be accessed through a web browser and displayed on a computer screen.

• A web page can contain text, pictures, sound, animation and video.

• A group of related web pages that are linked together form a Web Site.

• The first page of a web site is called the Home Page.

✓ Universal Resource Locator

• Each web page has a unique address called Universal Resource Locator (URL).

• Contains unique information about the server and the path on the server to find and retrieve the information

Example: <http://www.usd.edu/trio/tut/start/url.html>

http:// - protocol – rules through which transmission takes place over the internet.

www.usd.edu/ - server name - computer domain name

trio/tut/start/ - pathname to the directory you are requesting

url.html - filename you are requesting

✓ Search Engine

A web search engine is designed to search for information on the World Wide Web. The search results are usually presented in a list of results and are commonly called hits.

Few examples of web search engines are:

Google.com

Ask.com

Yahoo.com

Bing.com

TripleMe.com

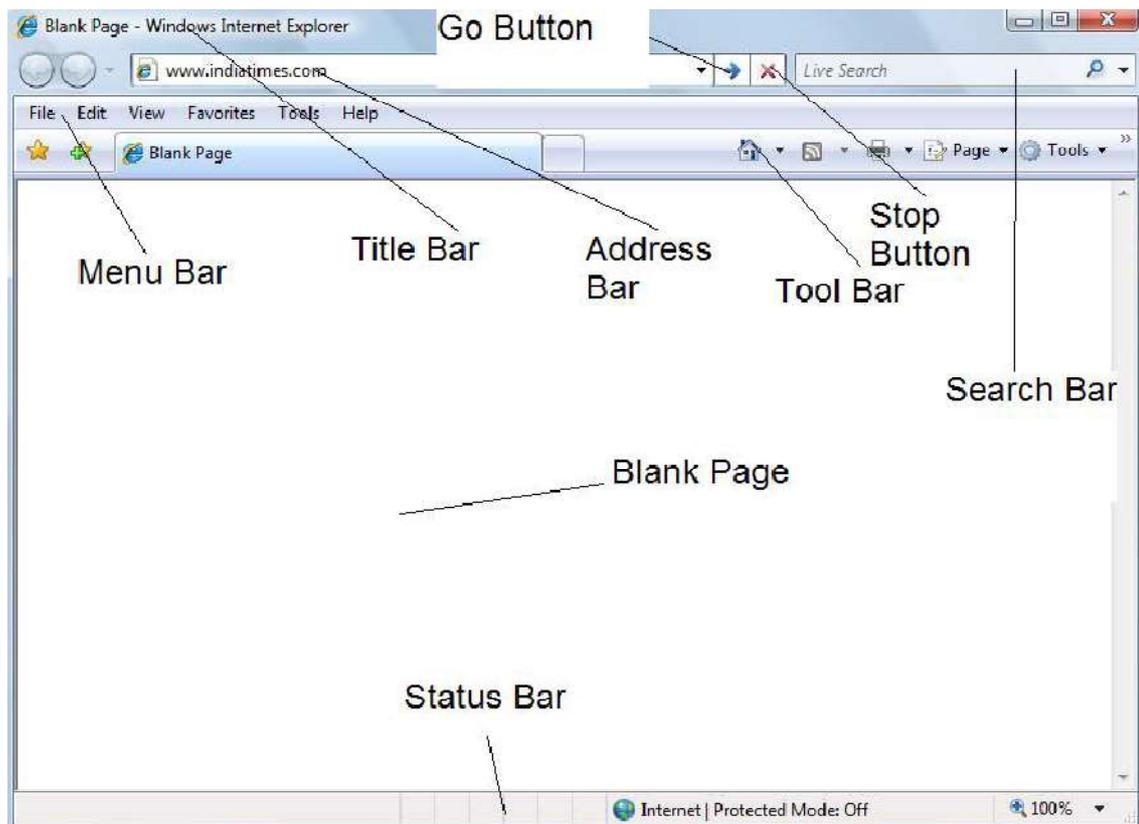
Shopzilla.com

✓ **Web browsing**

Browse means reading superficially or at random.

Reading information contained in the WebPages on the Internet using browsers is called web browsing.

A web browser is a software application for retrieving, presenting, and traversing information resources on the World Wide Web.



In the address bar of the browser enter the address of the website or enter the address of the any search engine.

If the address entered is a website then the corresponding webpage will get displayed.

In the search tab enter the information about your search. For example if you want to browse about computers enter the computers in the search tab.

Then click Search tab.

Components of Web:

Web Components are a set of features that provide a standard component model for the Web allowing for [encapsulation](#) and [interoperability](#) of individual [HTML elements](#).

Primary technologies used to create them include:

- a. Custom Elements – APIs to define new HTML elements
- b. Shadow DOM – Encapsulated DOM and styling, with composition
- c. HTML Templates, an HTML fragment is not rendered, but stored until it is instantiated via JavaScript

a. Custom Elements:

There are two parts to Custom Elements: autonomous custom elements and customized built-in elements. Autonomous custom elements are [HTML](#) elements that are entirely separated from native [HTML](#) elements; they are essentially built from the bottom up using the Custom Elements [API](#). Customized built-in elements are elements that are built upon native [HTML](#) elements to reuse their functionality.^[5]

b. Shadow DOM:

Shadow DOM is a functionality that allows the [web browser](#) to render [DOM](#) elements without putting them into the main document DOM tree. This creates a barrier between what the developer and the browser can reach; the developer cannot access the Shadow DOM in the same way they would with nested elements, while the browser can render and modify that code the same way it would with nested elements. The impact of CSS scoped within the Shadow DOM of a particular element is that [HTML](#) elements can be encapsulated without the risk of [CSS](#) styles leaking and affecting elements that they were not supposed to affect. Although these elements are encapsulated with regard to [HTML](#) and [CSS](#), they can still fire events that can be picked up by other elements in the document.

The scoped subtree in an element is called a shadow tree. The element the shadow tree is attached to is called a shadow host

c. HTML Template

HTML template is a way to insert chunks of [HTML](#) that are stamped at will. Scripts will not run, and resources that are inside a template will not be fetched until the template is stamped out.

d. Browser Support:

[HTML Templates](#) are supported in [Google Chrome](#), [Mozilla Firefox](#), [Microsoft Edge](#), [Safari](#), and [Opera](#).

Support for an early version of Custom Elements and Shadow DOM, known as "v0", is present in some [Blink](#)-based browsers like [Google Chrome](#) and [Opera](#) and is in [Mozilla Firefox](#) (requires a manual configuration change). The newer Custom Elements and Shadow DOM "v1" APIs are

implemented in [Safari](#), [Google Chrome](#), and [Mozilla Firefox](#)^{[11][12]} and are in development for Microsoft Edge.

Backward compatibility with older browsers is implemented using [JavaScript](#)-based [polyfills](#).

➤ **HTML:**

- ✓ **Hypertext Markup Language (HTML)** is the standard [markup language](#) for documents designed to be displayed in a [web browser](#). It can be assisted by technologies such as [Cascading Style Sheets \(CSS\)](#) and [scripting languages](#) such as [JavaScript](#).
- ✓ [Web browsers](#) receive HTML documents from a [web server](#) or from local storage and [render](#) the documents into multimedia web pages. HTML describes the structure of a web page [semantically](#) and originally included cues for the appearance of the document.
- ✓ [HTML elements](#) are the building blocks of HTML pages. With HTML constructs, [images](#) and other objects such as [interactive forms](#) may be embedded into the rendered page. HTML provides a means to create [structured documents](#) by denoting structural [semantics](#) for text such as headings, paragraphs, lists, [links](#), quotes and other items. HTML elements are delineated by *tags*, written using [angle brackets](#). Tags such as `` and `<input />` directly introduce content into the page. Other tags such as `<p>` surround and provide information about document text and may include other tags as sub-elements. Browsers do not display the HTML tags, but use them to interpret the content of the page.

➤ **XML:**

- **Extensible Markup Language (XML)** is a [markup language](#) that defines a set of rules for encoding [documents](#) in a [format](#) that is both [human-readable](#) and [machine-readable](#). The [W3C's XML 1.0 Specification](#) and several other related specifications—all of them free [open standards](#)—define XML.
- The design goals of XML emphasize simplicity, generality, and usability across the [Internet](#). It is a textual data format with strong support via [Unicode](#) for different [human languages](#). Although the design of XML focuses on documents, the language is widely used for the representation of arbitrary [data structures](#) such as those used in [web services](#).

➤ **The Difference Between XML and HTML**

HTML	XML
HTML is an abbreviation for HyperText Markup Language.	XML stands for eXtensible Markup Language.
HTML was designed to display data with focus on how data looks.	XML was designed to be a software and hardware independent tool used to transport and store data, with focus on
HTML is a markup language itself.	XML provides a framework for defining markup languages.
HTML is a presentation language.	XML is neither a programming language nor a presentation language.
HTML is used for designing a web-page to be rendered on the client side.	XML is used basically to transport data between the application and the database.
HTML has its own predefined tags.	While what makes XML flexible is that custom tags can be defined and the tags are invented by the author of the XML document.
HTML is not strict if the user does not use the closing tags.	XML makes it mandatory for the user to close each tag that has been used.
HTML does not preserve white space.	
HTML is about displaying data,hence static.	XML is about carrying information,hence

Example of XML

```
<?xml version="1.0">
<address>
<name> Krishna Rungta</name>
<contact>9898613050</contact>
<email>krishnaguru99@gmail.com
  </email>
<birthdate>1985-09-27</birthdate>
</address>
```

Example of HTML

```
<!DOCTYPE html>
<html>
<head>
<title> Page title </title> </head>
<body>
<h1> First Heading</h1> <p> First paragraph.</p> </body>
</html>
```

LECTURE 12: Preparation of Presentation, Import export operations using numerical/tabular data/text/graph/slides within different applications using cut-paste

Steps in Preparing a Presentation

Planning Your Presentation

Preparing a presentation can be an overwhelming experience if you allow it to be one. The strategies and steps below are provided to help you break down what you might view as a large job into smaller, more manageable tasks.

Step 1: Analyze your audience

The first step in preparing a presentation is to learn more about the audience to whom you'll be speaking. It's a good idea to obtain some information on the backgrounds, values, and interests of your audience so that you understand what the audience members might expect from your presentation.

Step 2: Select a topic

Next, if possible select a topic that is of interest to the audience and to you. It will be much easier to deliver a presentation that the audience finds relevant, and more enjoyable to research a topic that is of interest to you.

Step 3: Define the objective of the presentation

Once you have selected a topic, write the objective of the presentation in a single concise statement. The objective needs to specify exactly what you want your audience to learn from your presentation. Base the objective and the level of the content on the amount of time you have for the presentation and the background knowledge of the audience. Use this statement to help keep you focused as you research and develop the presentation.

Preparing the Content of Your Presentation

Step 4: Prepare the body of the presentation

After defining the objective of your presentation, determine how much information you can present in the amount of time allowed. Also, use your knowledge about the audience to prepare a presentation with the right level of detail. You don't want to plan a presentation that is too basic or too advanced.

The **body** of the presentation is where you present your ideas. To present your ideas convincingly, you will need to illustrate and support them. Strategies to help you do this include the following:

- Present data and facts
- Read quotes from experts
- Relate personal experiences
- Provide vivid descriptions

And remember, as you plan the body of your presentation it's important to provide variety. Listeners may quickly become bored by lots of facts or they may tire of hearing story after story.

Step 5: Prepare the introduction and conclusion

Once you've prepared the body of the presentation, decide how you will begin and end the talk. Make sure the introduction captures the attention of your audience and the conclusion summarizes and reiterates your important points. In other words, "Tell them what you're going to tell them. Tell them. Then, tell them what you told them."

During the **opening** of your presentation, it's important to attract the audience's attention and build their interest. If you don't, listeners will turn their attention elsewhere and you'll have a difficult time getting it back. Strategies that you can use include the following:

- Make the introduction relevant to the listeners' goals, values, and needs
- Ask questions to stimulate thinking
- Share a personal experience
- Begin with a joke or humorous story
- Project a cartoon or colorful visual
- Make a stimulating or inspirational statement
- Give a unique demonstration

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During the opening you want to clearly present your topic and the purpose of your presentation. Clearly articulating the topic and purpose will help the listeners focus on and easily follow your main ideas.

During the **conclusion** of your presentation, reinforce the main ideas you communicated. Remember that listeners won't remember your entire presentation, only the main ideas. By reinforcing and reviewing the main ideas, you help the audience remember them.

Practicing and Delivering

Step 6: Practice delivering the presentation

Most people spend hours preparing a presentation but very little time practicing it. When you practice your presentation, you can reduce the number of times you utter words and phrases like, "um," "well," and "you know." These habits can easily diminish a speaker's credibility. You can also fine-tune your content to be sure you make your most important points in the time allotted.

LECTURE13: Smartphone Apps in agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable Agri-information.

Smartphone Apps in Agriculture:

❖ Kisan Suvidha

Kisan Suvidha is an omnibus mobile app developed to help farmers by providing relevant information to them quickly. With click of a button, they can get the information on weather of current day and next 5 days, dealers, market prices, agro advisories, plant protection, IPM Practices etc. Unique features like extreme weather alerts and market prices of commodity in nearest area and the maximum price in state as well as India have been added to empower farmers in the best possible manner.

❖ Pusa Krishi

ZTM&BPD Unit; ICAR-IARI, New Delhi is leading 14 ICAR institutes of North Zone-I. The unit strives to be a strong link between the research community and the outside world. It promotes Agribusiness Ventures through technology development and commercialization for everyone from a corporate to an individual farmer. We have a variety of technologies / products for commercialization. Some technologies may be market ready, however some may require validation and some may require up scaling. We license our technologies to both private and public sectors.

❖ MKisan Application

This app has been designed and developed by inhouse IT team of DAC with the help of C-DAC Pune. It enables farmers and all other stakeholders to obtain advisories and information being sent by experts and government officials at different levels through mkisan portal without registering on the portal.

❖ Shetkari Masik Android App

“Shetkari Masik” is one of the most popular monthly magazines in the Agriculture sector, under publication since 1965. It is published by Department of Agriculture, Maharashtra.

The Android app for Shetkari magazine has a very simple interface and requires mobile internet or Wi-Fi connectivity to register and download the issues. Once downloaded, the magazine can be read without internet connectivity.

❖ **Farm-o-pedia**

Developed by CDAC, Mumbai. The application is a multilingual Android application targeted for rural Gujarat. The app is useful for farmers or anyone related to agriculture. It is available in English and Gujarati languages. The main functionalities of the app are:

1. Get suitable crops as per soil and season
2. Get crop wise information
3. Check weather in your area
4. Manage your cattle

❖ **Bhuvan Hailstorm App**

A mobile app has been developed to capture crop loss happened due to hailstorm. Agriculture Officer will go to the field with mobile or tablet loaded with this mobile app. This mobile app is able to capture following parameters :

1. Photograph of field with latitude and longitude.
2. Name of Crop
3. Date of sowing
4. Date of likely harvesting
5. Source of irrigation

This captured data will automatically be plotted to Bhuvan Portal and analysis can be done easily.

❖ **Crop Insurance mobile app**

Crop Insurance mobile app can be used to calculate the Insurance Premium for notified crops based on area, coverage amount and loan amount in case of loanee farmer. It can also be used to get details of normal sum insured, extended sum insured, premium details and subsidy information of any notified crop in any notified area.

❖ **AgriMarket**

AgriMarket mobile app can be used to get the market price of crops in the markets within 50 km of the device's location. This app automatically captures the location of person using mobile GPS and fetches the market price of crops in those markets which falls within the range of 50 km. There is another option to get price of any market and any crop in case person does not want to use GPS location.

❖ **Digital Mandi India**

This App helps in checking the latest Indian agricultural commodities Mandi prices from different states and districts. Easy to use and intuitive, the app enables farmers, traders and all others to know the updated Mandi price from anywhere. Its main features are:

- Browse through various commodity categories
- Browse prices in different states
- Simplified flow to reach the selected commodity's mandi price
- Copy the mandi price of a commodity
- Sync data from the Indian government portal Agmarknet.nic.in

❖ **MNCFC**

This Android based application, developed by National Remote Sensing Centre, ISRO, is useful for field data collection for crop assessment using satellite data under FASAL project of Ministry of Agriculture. The application can be used for collecting Field Photographs (640x480 resolution), GPS coordinates and Field information, such as crop type, condition, sowing date, soil type, etc. The farmers can also upload pictures taken through their mobile devices depicting status of the crops, varieties and soil as crowd sourcing. This information will be extremely useful in creating a national geospatial database of crops. The information can be sent in real-time, or later on using the Send Later option. All data received through this application reaches at ISRO's Bhuvan Server.

❖ **Crop Info**

Developed by Nirantara Livelihood Resources Private Limited, Bangalore, Karnataka. The Crop Info App provides Production Technology of commercially important Horticultural & Agricultural crops on your smartphone. It provides production aspects, post-harvest

technology, processing possibilities and market information. Crop Info is an App specifically developed for students & faculty of Agricultural & Horticultural Universities, Subject Matter Specialists & Extension Officials of Agriculture & Horticultural Departments, Private Sector Professionals, Farmers and anyone interested in cultivation of crops.

▣ **Precision Agriculture:**

- Precision agriculture, or precision farming, is a farming concept that utilizes geographical information to determine field variability to ensure optimal use of inputs and maximize the output from a farm.
- Precision agriculture gained popularity after the realization that diverse fields of land hold different properties.
- Large tracts of land usually have spatial variations of soils types, moisture content, nutrient availability and so on.
- Therefore, with the use of remote sensing, geographical information systems (GIS) and global positioning systems (GPS), farmers can more precisely determine what inputs to put exactly where and with what quantities.
- This information helps farmers to effectively use expensive resources such as fertilizers, pesticides and herbicides, and more efficiently use water resources.
- In the end, farmers who use this method not only maximize on their yields but also reduce their operating expenses, thus increasing their profits.

✓ **Geospatial Data Collection, Analysis, and Interpretation for Agricultural Purposes:**

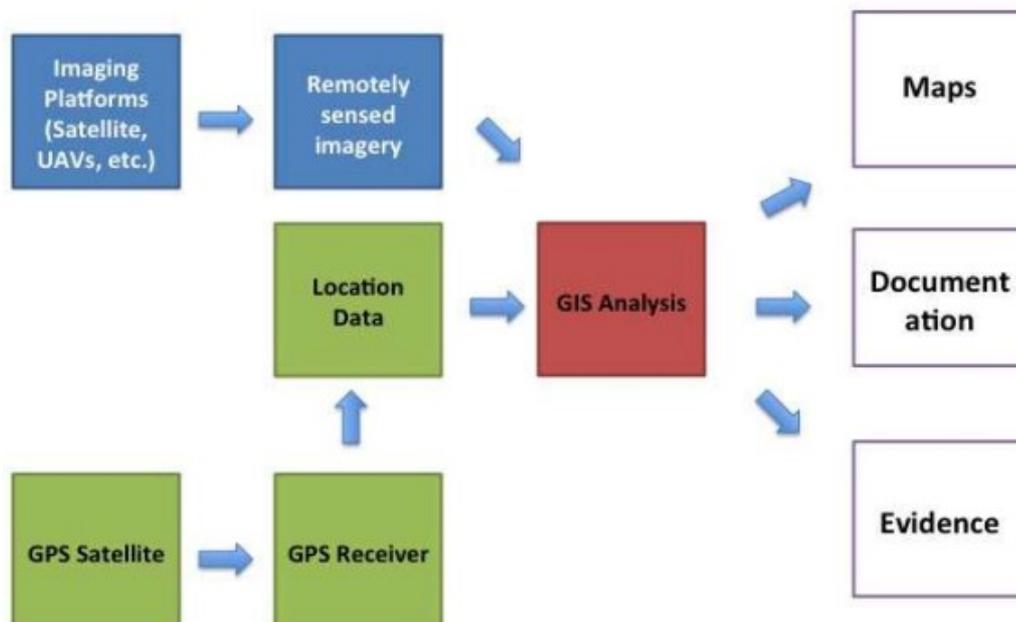
✓ **Geospatial Technnology:**

Geospatial technology refers to equipment used to measure and analyze Earth's land and features. Systems such as Global Positioning System (GPS) and Geographical Information System (GIS) are used in **geospatial** work.

The most common GTs are:

- **Remote sensing:** imagery and data collected from space- or airborne camera and sensor platforms (satellites, aerial, UAVs, terrestrial sensor). Some commercial satellite image providers now offer images showing details of one-meter or smaller.

- The **Geographic Positioning System (GPS)**: a network of U.S. Department of Defense satellites which can give precise coordinate locations to civilian and military users with proper receiving equipment (note: a similar European system called Galileo will be operational within the next several years while a Russian system is functioning but restricted).
- The **Geographic Information System (GIS)**: is a system designed to capture, analyse store, manage and present all types of spatial or geographical data. GIS use the space and time dimensions as the key index variable for all other information.



❖ **Approaches to Agriculture using Geo Spatial Technologies/Applications of Geospatial Technology**

- a. Climate Smart Agriculture
- b. Precision Agriculture
- c. Conservation Agriculture

a. Novel Technologies for Climate-Smart Agriculture

- ✓ Space-Technology derived applications developed at NASA
- ✓ MicroRadiometer for Climate-Smart Applications to reveal Climate Change in shallow waters close to land and in deep waters.
- ✓ Sensors Enable Plants to Text Message to Farmers to improve the nutrition, safety, and durability of food on Earth.

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- ✓ Photo-catalytic Solutions Create Self-Clearing Surfaces : A materials technology developed has future promising application, not only to keep surfaces clean, but potentially germ free.
- ✓ **Other Technologies**
- ✓ Climate Smart Agriculture Mechanization Using Robotics-Driverless tractors, Portal crop scouting platform, weed mapping, weeding, micro spraying, irrigation, and selective harvesting etc
- ✓ Drones for Climate-Smart Agriculture

b. How Geo-Spatial Technologies can help Precision Agriculture?:

- Precision agriculture (PA) is an approach to farm management that uses information technology (IT) to ensure that the crops and soil receive exactly what they need for optimum health and productivity. The approach is also known as satellite agriculture, as-needed farming and site-specific crop management (SSCM)
- Precision farming techniques are employed to increase yield, reduce production costs, and minimize negative impacts to the environment.
- Site-specific data (e.g. soil characteristics, fertility and nutrient data, topographic and drainage characteristics, yield data, harvester-mounted yield sensor data, and remotely-sensed vegetation indices) are collected from different sources and stored and managed in a spatial database

1. Soil types
2. pH rates
3. Pest infestation
4. Nutrient availability
5. Soil moisture content
6. Fertility requirements
7. Weather predictions
8. Crop characteristics
9. Hybrid responses

c. Site-Specific Crop Management

- GIS-GPS-RS technologies are used in combination for precision farming/site-specific crop management.
- GIS analytical capabilities measures variable parameters that can affect agricultural production include – Yield variability & Crop variability (e.g., density, height, nutrient & water stress, chlorophyll content) – Physical parameters of the field & Soil chemical and

physical properties – Anomalous factors (e.g., weed, insect, and disease infestation, wind damage) – Variations in management practices (e.g., tillage practices, crop seeding rate, fertilizer and pesticide application, irrigation patterns and frequency)

Range of Applications of GIS-GPS-RS in Agriculture



Lecture 14: Decision Support Systems, concepts, components and applications in Agriculture, Agriculture Expert system, Soil Information System etc, for supporting farm decisions.

□ Decision Support Systems:

Decision making is a major component of living and, therefore, a fascinating topic for discussion and investigation. Several fields in science also occupy themselves with the nature of different aspects of decision making: philosophy, psychology, sociology, economics, etc. In most institutional decision-making problems, there are three main aspects of concern:

- The information about the current situation and, possibly, about the past.
- The processes that are to be influenced by the decisions.
- The actual decision-making process.

For instance, decision making concerning acid rain illustrates the above three aspects clearly, as follows:

- The information consists of huge amounts of data regarding industrial, agri-cultural, and automotive activities. It also consists of data about wind and sun activities and about the types of power stations used.
- The processes to be influenced by the decisions consist of the production and emission of polluting material, together with the atmospheric transformation (chemical reactions and transportation) and the deposition process. Therefore the processes are basically of a physical and economic nature.
- The decision-making process consists of several interacting subprocesses at the local, national, and international levels.

❖ Definition:

DSS deal with semi-structured and some unstructured problems. With the ever-increasing advances in computer technology, new ways and means of computer-assisted decision-making was born. As a result hereof, over the passage of time, different DSS definitions arose:

- DSS is a model-based set of procedures for processing data and judgments to assist a manager in his decision making.
- “Decision Support Systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semi-structured problems.
- A decision support system is an interactive system that provides the user with easy access to decision models and data in order to support semi-structured and unstructured decision-making tasks.

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- DSS is a computer-based information system consisting of hardware/software and the human element designed to assist any decision-maker at any level. However, the emphasis is on semi-structured and unstructured tasks.
- DSS is a computer-based systems that help decision makers confront ill-structured problems through direct interaction with data and analysis models.
- DSS are computer-based systems that bring together information from a variety of sources, assist in the organisation and analysis of information and facilitate the evaluation of assumptions underlying the use of specific models.
- DSS is a computer-based information system that combines models and data in an attempt to solve semi-structured and some unstructured problems with extensive user involvement.

□ Components of DSS:

A decision support systems consists of three main components, namely database, software system and user interface..

1. **DSS Database:** It contains data from various sources, including internal data from the organization, the data generated by different applications, and the external data mined from the Internet, etc. The decision support systems database can be a small database or a standalone system or a huge data warehouse supporting the information needs of an organization. To avoid the interference of decision support system with the working of operational systems, the DSS database usually contains a copy of the production database.
2. **DSS Software System:** It consists of various mathematical and analytical models that are used to analyze the complex data, thereby producing the required information. A model predicts the output in the basis of different inputs or different conditions, or finds out the combination of conditions and input that is required to produce the desired output.

A decision support system may comprise different models where each model performs a specific function. The selection of models that must be included in a decision support system family depends on user requirements and the purposes of DSS. Note that the DSS software contains the predefined models (or routines) using which new models can be built to support specific type of decisions.

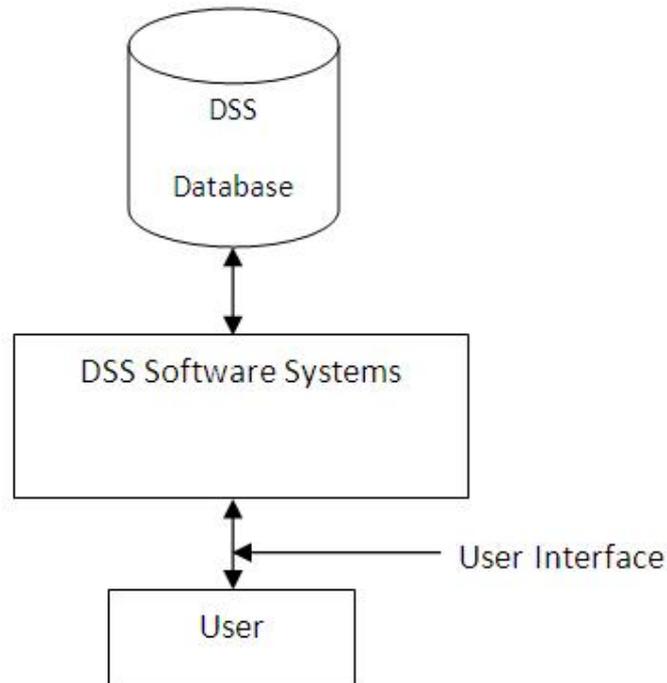


Figure 1. DSS Architecture

3. **DSS User Interface:** It is an interactive graphical interface which makes the interaction easier between the DSS and its users. It displays the results (output) of the analysis in various forms, such as text, table, charts or graphics. The user can select the appropriate option to view the output according to his requirement.

□ Applications of DSS in Agriculture:

1. DSS in crop productivity improvement

- DSS is widely applied in various parts of India for different agricultural management activities. Crop productivity being one such activity, it has given considerably good results with the use of DSS.
- The DSS named as “**Crop Environment Resource Synthesis (CERES) -Wheat**”, is a part of DSSAT which was successfully applied to simulate the crop growth and development of wheat under variable climatic, water and nitrogen levels in semi-arid and

subtropical regions of Punjab for five cropping seasons from 2000-2001 through 2004-2005.

- The model results concluded that grain yield and water productivity are affected by water holding capacity of the soils. This model was then extended with Cropping System Model (CSM) named as “DSSAT-CSMCERES-Wheat 4.0”
- **Cropping System Simulation Model (CropSyst)** is another simulation based DSS model linked with Geographical Information System (GIS).
- It uses the identical approach to simulate the growth and development of all herbaceous crops using periodic biomass and Leaf Area Index (LAI).
- It helped to decide water saving and water productivity policy for rice crop in Punjab by integrating crop management practices such as transplanting date, type of seed and irrigation.
- Indian Agriculture Research Institute (IARI) then evaluated CropSyst and CERES models, and results of evaluation demonstrated that these models can be effectively applied for on farm management activities such as irrigation and soil nitrogen management.

2. DSS in crop water requirements management

- DSS is also applied to careful management of water resources, crop water requirements.
- Crop water requirements depend on the factors such as evaporation, evapotranspiration, meteorological factors such as solar radiation, air temperature, humidity, wind speed etc.
- **CROPWAT DSS** helped to decide irrigation scheduling for different crop patterns and to calculate crop water requirements in eastern Godavari Delta, Andhra Pradesh. Along with climatic data it helped in assessment of reference evapotranspiration under temperature conditions of Kashmir Valley.
- It also gave good results when applied to simulate different crop water requirements as per the need of crop under different planting dates and probable canal water supplies for Noorpur distributary of Western Yamuna Canal system, West Bengal.
- Along with the DSSAT DSSAT-Cropping System Model(CSM) DSSAT-**CROPGRO(Crop Growth Model)** DSSAT-**Root Zone Water Quality Management (RZWQM)** DSSAT-P : (For Soil and Plant Phosphorous Management) GIS mapping model it was used to spatially analyze and study crop water requirements of rice in the eastern part of India. It also helped to study the spatial variation of climatic water balance, probabilistic monthly monsoon rainfall and mapping of cold periods in the region

3. DSS in irrigation scheduling

- Irrigation scheduling is one of the important activities in agriculture. A DSS tool for **Simulation of Water and SALT (SWASALT)** was calibrated and validated for irrigated areas in the semi - arid region of Haryana. It helped to prevent on farm water logging and soil salinization because of canal irrigation.
- This model was also used to calculate Water Management Response Indicators (WMRI) which helped to optimize the on farm irrigation schedule by minimizing the percolation losses to ground water for different soil types.
- GIS based integrated model of rainfall, soil, water use, canal flow model, soil water balance model and groundwater flow model is used as an effective DSS tool. It helped to increase crop production for different cropping pattern as per the groundwater availability for Godavari Delta Central Canal Irrigation Project in Andhra Pradesh.

4. DSS based on climatic data

- Climatic parameters such as temperature, rainfall, sunshine hours play a very important role in crop production. DSSAT Cropping System Model (DSSAT-CSM) was also applied to study impact of climatic parameters in rice-wheat system productivity over the Indo-Gangetic plains of India.
- The comparison of observed and simulated rice and wheat yield showed that, along with climatic parameters crop productivity can be improved by integrating biotechnological advancements and precision farming.
- A simulation based multi-year, multi-crop and daily time step cropping based model called as “**Crop Production and Management (CROPMAN)**” model was used in Punjab to study the effects of different dates of transplanting and weather parameters on yield, evapotranspiration and water productivity. The analysis showed that rice yield in Punjab can be increased by shifting of transplanting from mid May to lower June onwards

5. DSS in advisory system

- Advisory DSS is playing extremely important role in Indian agriculture. **e-Sagu**, farm specific DSS developed by IIIT, Hyderabad, and Media Lab Asia under the aegis of Media Lab Asia which helped to improve farm productivity by delivering high-quality farm specific agro-expert decisions in a timely manner to each farm at the farmer's doorsteps.

- The advice was provided at all stages of cultivation of crops from sowing to harvesting, which reduces the cost of cultivation and increases farm productivity as well as quality of Agricultural commodities.
- “**mKRISHITM**” DSS tool developed by Tata Consultancy Services and was deployed in Bargaon village, Maharashtra, for proper nutrient and pest management advice for grape farms through mobile phones.
- Integrated Pest Management is an important parameter in agriculture. An Integrated Pest Management (IPM) DSS called as “**Cell Phone**” was developed for sustainable plant protection of south 24 paraganas, West Bengal. The DSS helped for sustainable IPM by creating continuous awareness among farmers and in turn to improve crop productivity.

□ Expert Systems in Agriculture

Initially, computer scientists were interested in capturing non-quantitative decision making models in a computer, and they used expert systems to generate those models. What were some basic assumptions about human reasoning that drove expert systems? Perhaps the initial primary assumptions were:

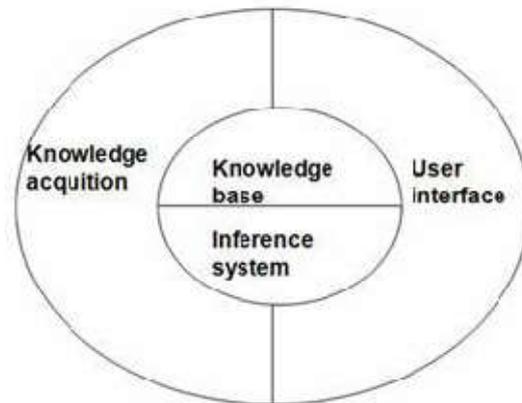
- ✓ Experts know more than non experts.
- ✓ People use information and knowledge based on their past experience.
- ✓ People use heuristics.
- ✓ People use specific, a priori rules to solve problems.
- ✓ People use focused knowledge to solve problems.

Structural Nature of Expert Systems

Because it was assumed that human problem solvers used rules and knowledge could be captured as rules, rule bases and their processing were the critical component of expert systems (Figure 12.1). Accordingly, the structure of a classic expert system was designed to meet those needs. Ultimately, expert systems were composed of six components:

- a. data/database
- b. user interface
- c. user
- d. knowledge base/rule base and
- e. An inference engine to facilitate analysis of that knowledge base.

f. An expert system software.



a. Data

The data used by the system could include computer-generated data, data gathered from a database, and data gathered from the user. For example, computer-generated data might derive from an analysis of financial statement data as part of a program to analyze the financial position of a company. Additional data might be selectively gathered straight from an integrated database. Further, the user might be required to generate some assessment or provide some required data. Typically, initial expert systems required that the user provide key inputs to the system.

b. User Interface

Since the user typically interacted with the system and provided it with data, the user interface was critical. However, an expert system user interface could take many forms. Typically, there would be a question from the system, and the user would select one or more answers from a list, as in a multiple choice test. From there, the system would go to another question, and ultimately provide a recommended solution. In some cases, the user would need to analyze a picture or a movie clip in order to answer the questions.

c. User

In any case, in a classic expert system, the user is a key component to the system, since it is the user who ultimately provides environmental assessments, generates inputs for the system and as a result, disambiguates the questions provided by the system to gather data from the user. Research has found that different user groups, e.g., novice or expert, given the same interrogation by the system, would provide different answers. As a result, generating that user interface and building the system for a particular type of user are critical

d. Knowledge Base/Rule Base

The knowledge base typically consisted of a static set of —if...then...I rules that was used to solve the problem. Rules periodically could be added or removed. However, the knowledge needed for solving the particular problem could be summarized, and isolated. In addition, the very knowledge that was used to solve an inquiry also could be used to help explain why a particular decision was made. (Some researchers also include explanation facility as its own component.) Accordingly, gathering, explaining, and verifying and validating that knowledge is the focus of most of the rest of this discussion in this paper.

e. Inference Engines

Inference engines facilitate use of the rule-base. Given the necessary information as to the existing conditions provided by the user, inference engines allow processing of a set of rules to arrive at a conclusion by reasoning through the rule base. For example with the system —if a then b, and —if b then c would allow us to —reason that a led to b and then to c. As rule-based systems became the norm, the inference engine saved each developer from doing the same thing, and allowed developers to focus on generation of the knowledge base. Developers became referred to as knowledge engineers. Ultimately, data was gathered, combined and processed with the appropriate knowledge to infer the matching solution.

f. Expert System Software

Because the expert system components were distinct, software could be designed to facilitate the ability of developers to focus on problem solution, rather than building the components themselves. As a result, a wide range of so-called —expert system shells were generated, for example, EMYCIN, ART (Automated Reasoning Tool by Inference Corporation).

□ Definition of Expert Systems:

Accordingly, over the years there have been a number of definitions of expert systems, including the following:

- ✓ A program that uses available information, heuristics, and inference to suggest solutions to problems in a particular discipline.
- ✓ The term expert systems refer to computer programs that apply substantial knowledge of specific areas of expertise to the problem solving process.
- ✓ The term expert system originally implied a computer-based consultation system using AI techniques to emulate the decision-making behavior of an expert in a specialized, knowledge-intensive field.

As a result, we will call a system an expert system when it has the following characteristics:

- A rule-based approach is used to model decision making knowledge, and that those rules may include some kind of factor, to capture uncertainty.
- Interacts with a user from whom it gathers environmental assessments, through an interactive consultation (not always present).
- Designed to help facilitate solution of a particular task, typically narrow in scope.
- Generally performs at the level of an informed analyst.

□ Soil Information System:

Soil Information System (SIS) is an industry leading soil mapping technology that uses advanced sensors and intelligent targeting and geo-processing algorithms to produce high resolution, accurate soil and topographic information. By providing a greater understanding of the physical and

chemical characterization of the soil, including how inputs move through the soil, SIS enables farmers' trusted advisors to implement more effective solutions to resolve the unique challenges of each area of their fields. This information can be used to make critical farm management decisions with irrigation, drainage, fertility, and more.

Key Features

- Assess detailed soil properties for each field such as soil texture, compaction, root zone depth, moisture retention and availability, and soil fertility
- View soil analysis for the top 48 inches (122 cm) of the field's surface in 3D
- Download soil maps into your farm management software application, including [Trimble Ag Software](#) or other third-party software systems
- Create variable rate application maps from the soil information to help maximize plant growth

Types of Maps

SIS offers precise 3D soil models for dozens of soil physical and chemical characteristics including:

- Root zone depth
- Soil texture (clay, sand, coarse fragment content)
- Moisture holding capacity
- Compaction characteristics
- Macro and micro-nutrient levels
- Salt and toxicity concentrations

Applications:

1. Pre-Purchase Land Evaluation

SIS makes it possible to obtain a complete picture of the land you are considering before purchase or development. With a SIS analysis you will be able to predict a field's potential for growing capacity and identify challenges that will come up in the course of layout and planting. SIS helps growers avoid the pitfalls associated with sub-optimal soil properties that can permanently limit crop quality and yield.

2. Field Preparation and Field Design

The single greatest opportunity a grower has to influence the long-term output of any field, vineyard, or orchard comes with the design and planting of a new field. Utilizing the SIS ensures that growers are able to design and prepare fields that are optimized for the long-term. SIS makes it possible to know precisely where to add deep-root amendments, select and plant crop varieties based on known moisture holding characteristics, and minimize in-field variability.

3. Improve Crop Quality

SIS gives growers the tools they need to optimize growing conditions and improve overall crop quality. Plant materials within a field may be uniform, but the soils in which those crops grow are not. With SIS, growers can assess the variability within a field and treat different zones according to their unique needs, thereby raising quality to the highest grade achievable throughout the field.

4. Increase Output from Sub-par Field Areas

Despite best efforts, sub-par field areas can vex even the most committed grower. SIS can eliminate the guesswork and experimentation that goes into "fixing" these areas by revealing the exact factors that are limiting yield. Understand what keeps these areas from meeting production standards and design a strategy to bring all field areas to maximum growing capacity.

5. Optimize the Use of Water, Fertilizer, and Amendments

Growers can immediately improve their bottom line by employing more efficient watering, fertilizer, and amendment application strategies. The difficulty comes with knowing where and to what degree you can reduce inputs without compromising crop quality. SIS makes it possible to target applications – making sure expensive inputs are used efficiently. Growers using SIS data no longer need to manage to the lowest common denominator, instead they can take advantage of naturally occurring availability while concentrating on helping low-productivity areas achieve higher yield and quality.

Advantages:

- Making critical soil and farm management decisions with irrigation, drainage, fertility and amendment applications
- Saving time and operating costs by using soil variability to target precise sampling locations, sometimes reducing the number of samples taken by 60% over traditional sampling methods
- Improving input application by showing where they need to be applied to maximize plant growth
- Making better soil management decisions with irrigation, drainage, and fertility data
- Maximizing plant growth using soil information from variable rate application maps

Lecture 15: Communication Process, Berlo's Model, Feedback and barriers to communication.

Introduction to Communication:

Communication is a learned skill. However, while most people are born with the physical ability to talk, not all can communicate well unless they make special efforts to develop and refine this skill further.

Very often, we take the ease with which we communicate with each other for granted, so much so that we sometimes forget how complex the communication process actually is.

Definition:

Communication is the process of exchanging information, thought, ideas, and feelings from one individual to another. Communication is a two way process by which a message is passed from the sender to the receiver with the objective that message sent is received and understood as intended.

The Basic Elements of Communication process

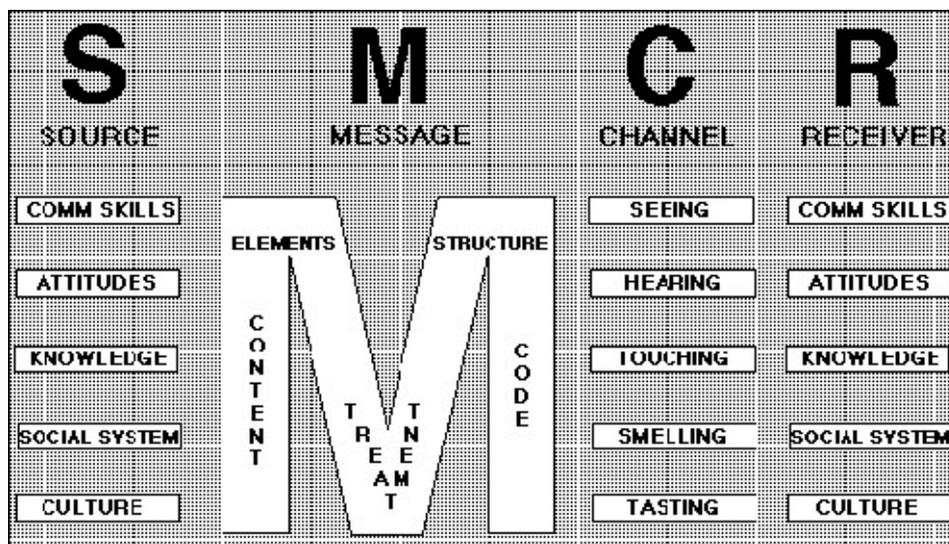
1. **The Sender:** The communication process begins when a person, known as the sender, generates a message. Messages stem from a person's need to relate to others, to create meanings, and to understand various situations
2. **The Message:** The message is a stimulus produced by a sender and responded to by a receiver. Messages may be verbal, nonverbal, written materials, and artistic.
3. **The Channel:** The channel is the medium through which a message is transmitted. There are three major communication channels: visual, auditory, and kinesthetic. The visual channel consists of sight and observation. The auditory channel consists of spoken words and cues. The kinesthetic channel refers to experiencing sensations.
4. **The Receiver:** The receiver is the person who intercepts the sender's message. Receiving is influenced by complex physiological, psychological, and cognitive processes. The physiological component involves the process of hearing.
5. **Feedback:** Feedback is the information the sender receives about the receiver's reaction to the message. The function of feedback is to provide the sender with information about the receiver's perception of a situation. Having this information, the sender can then adjust the delivery of the message to communicate more effectively.

□ Berlo's Communication Model:

The Berlo's model of communication takes into account the emotional aspect of the message. Berlo's model of communication operates on the SMCR model.

In the SMCR model

- S - Source
- M - Message
- C - Channel
- R - Receiver



S - Source

The source in other words also called the sender is the one from whom the thought originates. He is the one who transfers the information to the receiver after carefully putting his thoughts into words.

How does the source or the sender transfer his information to the recipient ?

It is done with the help of communication skills, Attitude, Knowledge, Social System and Culture.

▪ **Communication Skills**

An individual must possess excellent communication skills to make his communication effective and create an impact among the listeners. The speaker must know where to take pauses, where to repeat the sentences, how to speak a particular sentence, how to pronounce a word and so on. The speaker must not go on and on. He should also make a point to cross

check with the recipients and listen to their queries as well. An individual must take care of his accent while communicating. A bad accent leads to a boring conversation.

- **Attitude**

It is rightly said that if one has the right attitude, the whole world is at his feet. There is actually no stopping for the person if he has the right attitude. A person might be a very good speaker but if he doesn't have the right attitude, he would never emerge as a winner. The sender must have the right attitude to create a long lasting impression on the listeners. An individual must be an MBA from a reputed institute, but he would be lost in the crowd without the right attitude.

- **Knowledge**

Here knowledge is not related to the educational qualification of the speaker or the number of degrees he has in his portfolio. Knowledge is actually the clarity of the information which the speaker wants to convey to the second party. One must be thorough in what he is speaking with complete in-depth knowledge of the subject. Remember questions can pop up anytime and you have to be ready with your answers. You need to be totally familiar with what you are speaking. Before delivering any speech, read as much you can and prepare the subject completely without ignoring even the smallest detail.

- **Social System**

Imagine a politician delivering a speech where he proposes to construct a temple in a Muslim dominated area. What would be the reaction of the listeners ? They would obviously be not interested. Was there any problem in the communication skills of the leader or he didn't have the right attitude ? The displeasure of the listeners was simply because the speaker ignored the social set up of the place where he was communicating. He forgot the sentiments, cultural beliefs, religious feelings of the second party. Had it been a Hindu dominated society, his speech would have been very impressive.

- **Culture**

Culture refers to the cultural background of the community or the listeners where the speaker is communicating or delivering his speech.

M - Message

When an individual converts his thoughts into words, a message is created. **The process is also called as Encoding.**

Any message further comprises of the following elements:

- **Content**

One cannot show his grey matter to others to let him know what he is thinking. A thought has to be put into words and content has to be prepared. Content is actually the matter or the script of the conversation. It is in simpler words, the backbone of any communication.

Ted to Jenny -“I am really exhausted today, let’s plan for the movie tomorrow evening”.

Whatever Ted has communicated with Jenny is actually the content of the message. It is very important for the speaker to carefully choose the words and take good care of the content of the speech. The content has to be sensible, accurate, crisp, related to the thought to hit the listeners bang on and create an immediate impact.

- **Element**

It has been observed that speech alone cannot bring a difference in the communication. Keep on constantly speaking and the listeners will definitely lose interest after some time. The speech must be coupled with lots of hand movements, gestures, postures, facial expressions, body movements to capture the attention of the listeners and make the speech impressive. Hand movements, gestures, postures, facial expressions, body movements, gestures all come under the elements of the message.

- **Treatment**

Treatment is actually the way one treats his message and is conveys to the listeners. One must understand the importance of the message and must know how to handle it. If a boss wants to fire any of his employees, he has to be authoritative and can’t express his message in a casual way. This is referred to as the treatment of the message. One must understand how to present his message so that the message is conveyed in the most accurate form.

- **Structure**

A message cannot be expressed in one go. It has to be properly structured in order to convey the message in the most desired form.

- **Code**

Enter a wrong code and the locks will never open. Enter a wrong password, you will not be able to open your email account. In the same way the code has to be correct in the communication. Your body movements, your language, your expressions, your gestures are actually the codes of the message and have to be accurate otherwise the message gets distorted and the recipient will never be able to decode the correct information.

C - Channel

Channel - Channel actually refers to the medium how the information flows from the sender to the receiver.

How does one know what the other person is speaking ? - Through **Hearing**.

How does one know whether the pasta he has ordered is made in white sauce or not ? - Through **Tasting**.

How does one know that there is a diversion ahead or it's a no parking zone? - Through **Seeing**.

How will an individual come to know that the food is fresh or stale ? How do we find out the fragrance of a perfume ? - Through **Smelling**.

How will you find out whether the milk is hot or not ? - Through **Touching**.

All the **five senses are the channels** which help human beings to communicate with each other.

R - Receiver

When the message reaches the receiver, he tries to understand what the listener actually wants to convey and then responds accordingly. **This is also called as decoding.**

The receiver should be on the same platform as the speaker for smooth flow of information and better understanding of the message. He should possess good communication skills to understand what the speaker is trying to convey. He should have the right attitude to understand the message in a positive

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way. His knowledge should also be at par with the listener and must know about the subject. He should also be from the same social and cultural background just like the speaker.

There are several loopholes in the Berlo's model of communication. According to the Berlo's model of communication, the speaker and the listener must be on a common ground for smooth conversion which is sometimes not practical in the real scenario.

Criticism of Berlo's smcr model of communication:

1. No feedback / don't know about the effect
2. Does not mention barriers to communication
3. No room for noise
4. Complex model
5. It is a linear model of communication
6. Needs people to be on same level for communication to occur but not true in real life
7. Main drawback of the model is that the model omits the usage of sixth sense as a channel which is actually a gift to the human beings (thinking, understanding, analyzing etc).

❑ Role of Feedback in Communication Process:

Communication is the exchange and flow of information and ideas from one person to another. It involves a sender transmitting an idea, information, or feeling to a receiver. Effective communication occurs only if the receiver understands the exact information or idea that the sender intended to transmit.

The communication has a vicious cycle which continues even after sending message to the respondents. The audience or the respondents may or get the same intended message as the speaker intends to send. This cycle ends only when they share their understandings and comments to the speaker about what they have understood. This process is called feedback.

1. It completes the whole process of communication and makes it continuous.
2. It sustains communication process
3. It makes one know if one is really communication or making sense
4. It is a basis for measuring the effectiveness of communication
5. It is a good basis for planning on what next to be done especially statistical report
6. Communication will be useless without feedback

7. Feedback paves way for new idea generation

❑ **Barriers to Communication:**

1. Physical Barriers

Open plan building designs are attractive as they allow colleagues to communicate quickly and efficiently. The moment you shut the door to your office, create distance between people or erect walls that divide your staff, you are creating physical barriers to effective communication. Sometimes these obstacles are unavoidable, such as companies that have offices in different locations, but there are solutions such as video technology and other advancements that can alleviate these hurdles.

2. Perceptual Barriers

While physical barriers are easy to see, perceptual barriers are those you erect in your mind. The way you communicate could be affected by preconceived ideas, your typical behaviour patterns or misunderstood body language. You must keep an open mind when talking, be interested in the conversation, and clearly articulate your message so any negative assumptions made about you by others will fade away.

3. Emotional Barriers

Self-confidence plays an enormous role in breaking down psychological barriers. By having an in-depth understanding of the information you're sharing with others, you will be able to deliver it with clarity. This knowledge increases the probability that those receiving the information will understand it and be able to act on it. However, sometimes our emotions take over when communicating with others, and feelings such as anger, pride and anxiety can cloud our judgment and prevent great communication. Emotional intelligence is an incredibly important skill to learn if you want to be seen as a leader within your organisation, and being able to keep your emotions, and the emotions of those around you in check will lead to a more highly efficient team.

4. Cultural Barriers

Modern business is conducted in a global community, whether it's the mix of staff in the workplace, or working with colleagues, suppliers, and retailers in other parts of the world. By understanding cultural sensitivities of any business stakeholder, and respecting their values and beliefs, cultural barriers can be removed from the process. Respect is the key, at times, you will have to adapt to others while other occasions people joining your organisation will have to adjust. By identifying cultural differences and developing strategies to accommodate them, you are far more likely to enjoy more exceptional communication in your business.

5. Language Barriers

Communicating with people whose native language is not English can pose problems. However, it's not the only language issue businesses face. The way people speak is different from each generation, speech impediments can cause comprehension issues, and industry specific language may be difficult to understand for someone unaccustomed to it. Utilising common sense strategies such as translation services, learning the basics of the foreign language, and using multiple methods of communication such as video can overcome these language barriers.

6. Gender Barriers

Men and women are different, and while workplace relations between genders have improved astronomically over recent years, there are times when communications break down for one reason or another. Communication styles between genders are often different, which could cause problems between work colleagues, so it's important to be respectful of each other. Effective communication can only be achieved between genders if everyone feels safe when offering their ideas and opinions.

7. Interpersonal Barriers

Poor self-esteem or an inability to make connections with others can prohibit us from actually communicating with our colleagues. This challenge can lead to withdrawal from the business dynamic, keeping your opinions and ideas to yourself and removing yourself from the workplace community. And because forcing yourself to communicate with others is the best way to overcome this barrier, it can be tough to break. Taking small steps by keeping your communications simple, listening to others and staying calm, will build self-confidence over time.

LECTURE 16 : OPERATING SYSTEM: EXAMPLES

Operating System

Operating system is a set of software that controls and manages hardware and basic system operations for a computer. The operating system loads programs into the computer's memory, runs these programs, and manages peripherals like disks and printers.

Example:

Disk Operating System (DOS)



Windows



LINUX



Mac



UNIX

UNIX™

Disk Operating System (DOS)

- In the 1980s or early 1990s, the operating system that shipped with most PCs was a version of the Disk Operating System (DOS) created by Microsoft: MS-DOS.
- MS-DOS is a disk-based, single-user, single-task and character based user interface (CUI) operating system.

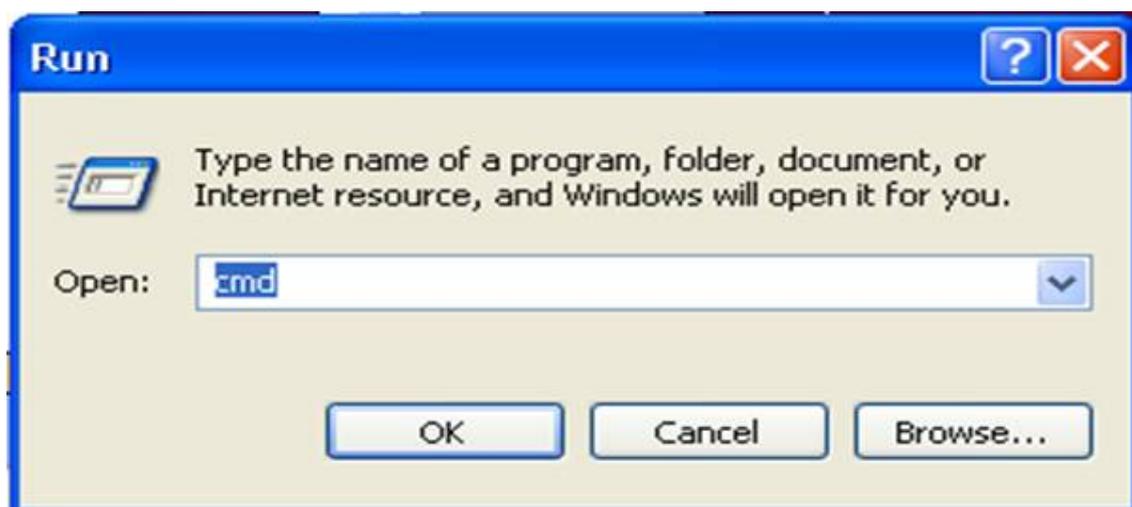
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Go to MSDOS from Windows Operating System:

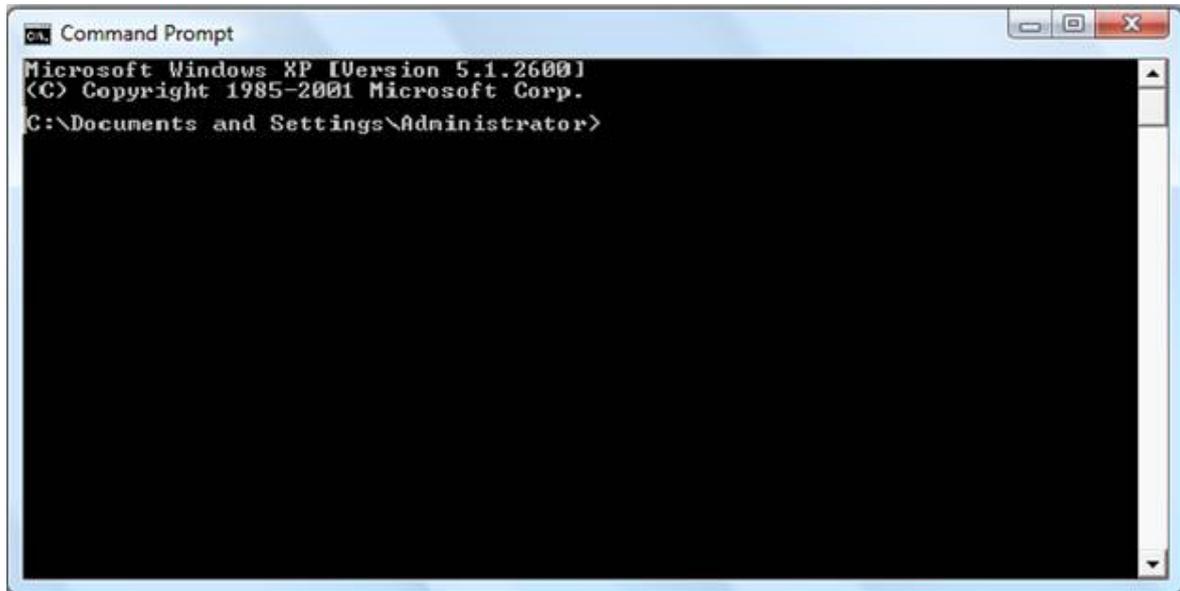
Click Start Button à Choose Program à Choose Accessories à Click Command Prompt as shown below:



Or Click Start Button à Choose Run à Type cmd in the Open tab as shown below:



Command Prompt will get displayed as shown:



The DOS commands can be entered in the command prompt and executed.

WINDOWS

- An operating system with a graphical user interface (GUI).
- Graphical User Interface (GUI) is a user interface based on graphics (icons and pictures and menus) instead of text; uses a mouse as well as a keyboard as an input device)

Versions

- Windows 98
- Windows Me
- Windows NT
- Windows 2000
- Windows XP
- Windows Server 2003
- Windows Vista
- Windows 7
- Windows 8
- Windows 10

Desktop and its elements

- In Windows operating system the basic working platform is the desktop.
- It is also the opening screen of the Windows operating system.

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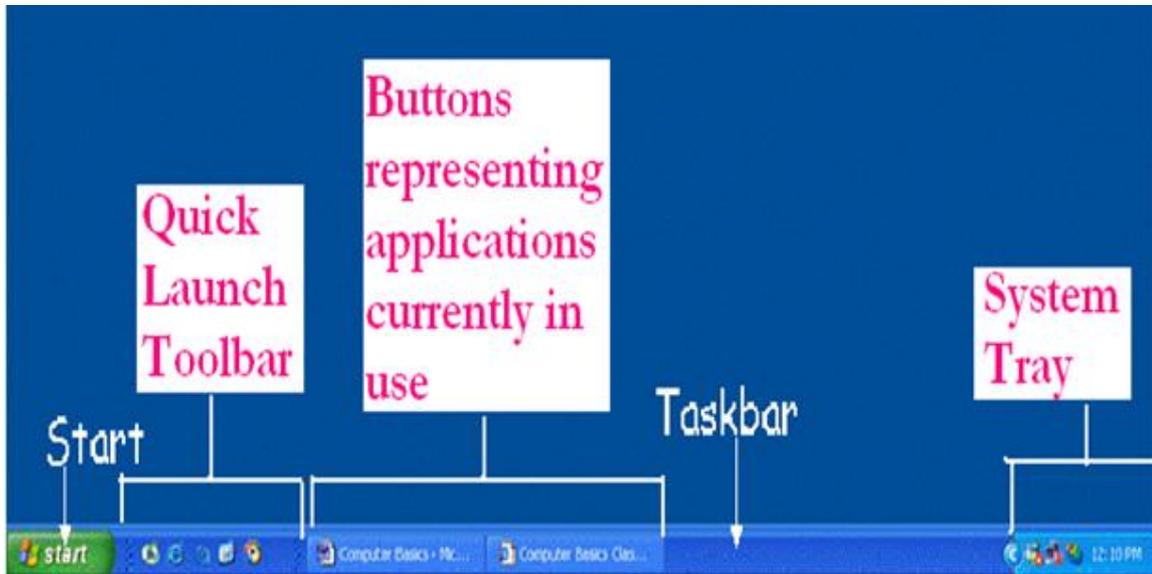


- The desktop contains:
 - Taskbar
 - Icons

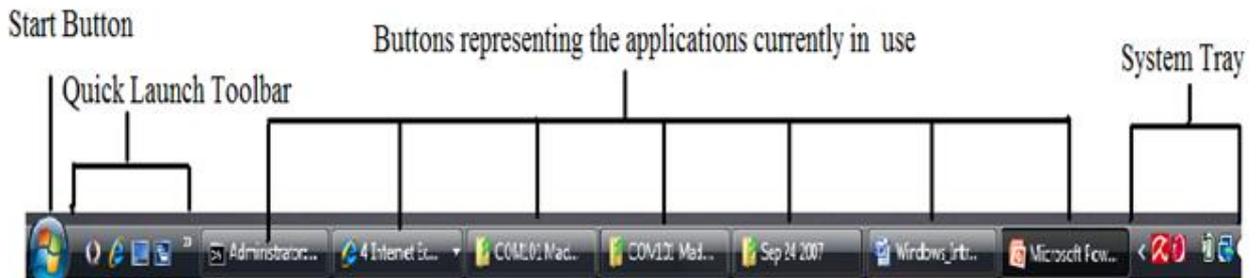
Taskbar

- Taskbar is usually a narrow strip present at the bottom of the screen.

Windows XP Taskbar



Windows Vista Taskbar



Icons

- Icons are small pictures/images representing applications.
- Each icon has a label telling the name of the application it represents.

Example:

Computer

- lists the contents of floppy disk, hard disk, CD-ROM drive, and mapped network drives



Agri-Informatics Lecture Notes

Network

- locates shared resources on the entire network to which the computer is connected.



Recycle Bin

- stores deleted files, folders, graphics, and Web pages until you empty the bin.



Internet Explorer

- opens the browser internet explorer.



Windows Explorer

Windows Explorer is a file manager application used to view and manage drives, folders, and files. Windows Explorer can be opened by clicking on

Start > My Computer or using the short cut key Windows + E while in Windows Xp

Start > Computer or using the short cut key Windows + E while in Windows Vista.

