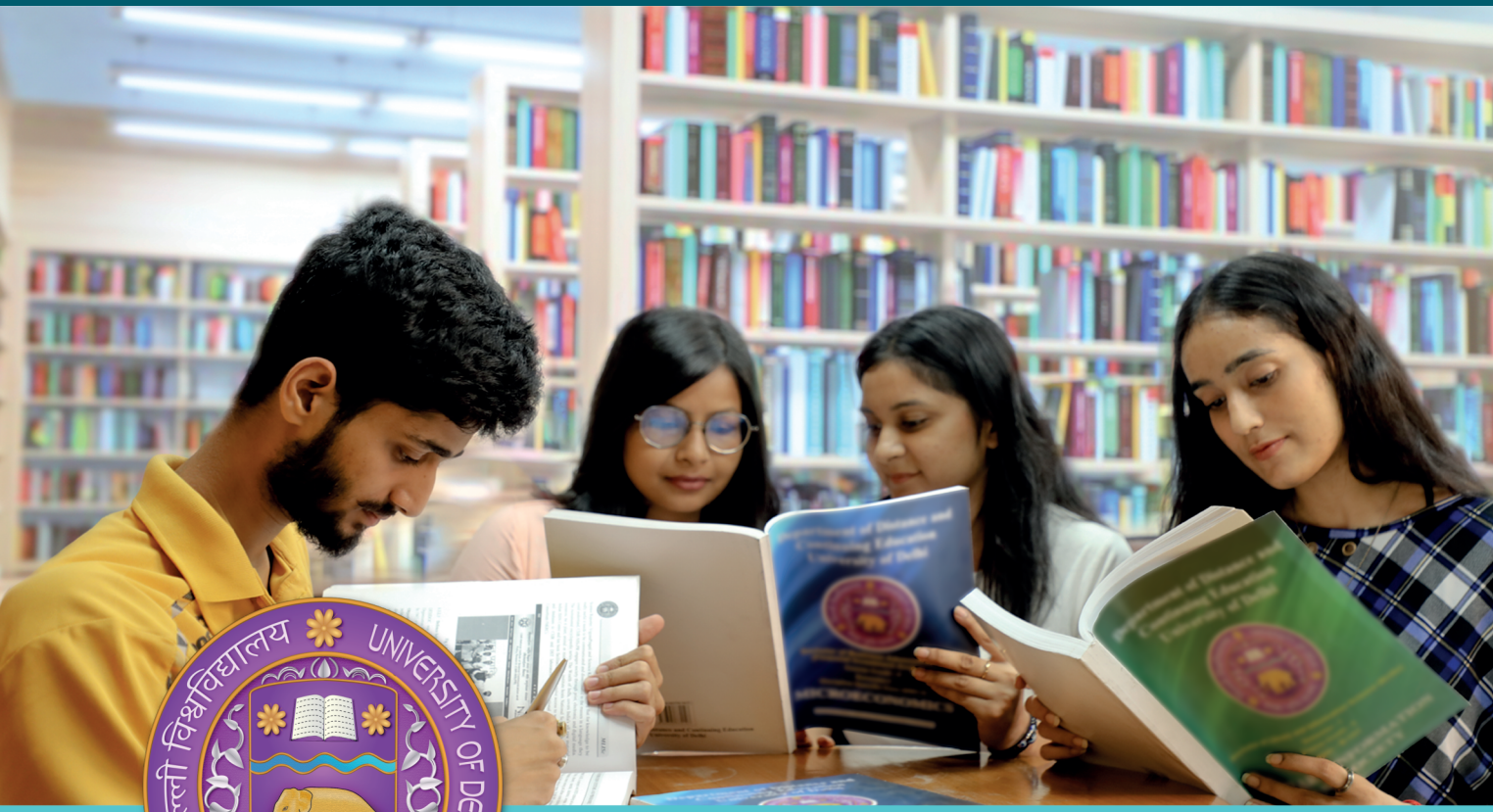
INFORMATION TECHNOLOGY MANAGEMENT

MASTER OF BUSINESS ADMINISTRATION (MBA)

CORE COURSE - MBAFT - 6108

SEMESTER - I COURSE CREDIT - 4.5



DEPARTMENT OF DISTANCE AND CONTINUING EDUCATION
CAMPUS OF OPEN LEARNING, SCHOOL OF OPEN LEARNING,
UNIVERSITY OF DELHI

ISBN: 978-93-95774-11-6

E-mail: ddceprinting@col.du.ac.in
management@col.du.ac.in

Published by:
Department of Distance and Continuing Education
Campus of Open Learning, School of Open Learning,
University of Delhi, Delhi-110007

Printed by:
School of Open Learning, University of Delhi

Reviewer

Dr. Reema Thareja

This Study Material is duly recommended in the meeting of Standing Committee held on 17/11/2022 and approved in Academic Council Meeting held on 22/11/2022 vide item No. 1012 and subsequently Executive Council Meeting held on 08/12/2022 vide item No. 38 {38-1(38-1-13)}

Corrections/Modifications/Suggestions proposed by Statutory Body, DU/ Stakeholder/s in the Self Learning Material (SLM) will be incorporated in the next edition. However, these corrections/modifications/suggestions will be uploaded on the website https://sol.du.ac.in.

Any feedback or suggestions can be sent to the email-feedback.slm@col.du.ac.in.

Printed at: **Taxmann Publications Pvt. Ltd., 21/35, West Punjabi Bagh, New Delhi - 110026 (2500 Copies, 2024)**

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LESSON

1

Introduction to Computers

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STRUCTURE

1.1 Learning Objectives

- Explain the term Information Technology.
- About Computer generations & Languages.
- Elements of Information Technology & Computers.

Notes

- Usage of Information Technology & Computers for Business Organizations.
- Emerging trends in Information Technology & Computers.

1.2 Introduction

Information Technology (IT) is related to all Information and become a strategic necessity. Nowadays computers and IT is part of the life of every human being such as used in government, for commercial purpose, in-home, etc. Computers have many usages in business organizations. Computers started in this world a long and describe five generations. Computers are interacting with the help of main elements *i.e.*, hardware and software. The integration of hardware and software with the end users required different computer languages for distinct purposes. Business Organisations are growing enough with the help of information technology and the use of computers. New trends in business organizations, planning an Information Technology as part of it working on growing pace. There are many emerging technologies growing well and users are adopting them at a growing pace such as Cloud, Social Media, IoT, Robotics, etc.

1.3 Computers: An Introduction

Computers and IT is spreading rapidly all over the world and revolutionized business as well as the personal activities of human beings. Either good or bad, computers have infiltrated every aspect of our society. Today's computers not only compute for which it was but do much more. It works in every field or profession. As computers adopt in commerce and governments new ways to harness their potential developed. So, a small unit becomes more powerful, it is linked together or networked, to share software, memory space, and any kind of data for communicating with society.

A computer is an electronic device that accepts data and instructions, processes the data and produces the desired output. It can be said as data processing machine or a problem-solving machine that accepts data, stores data, processes data and display results. Computers are ahead to human beings for speed, accuracy, memory and diligence but cannot beat the human brains, they are not intelligent.

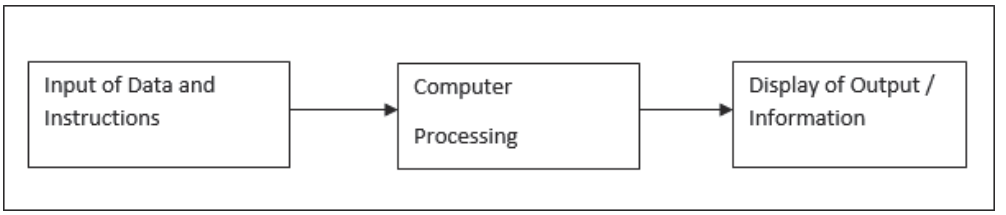

Figure 1.1: Processing Diagram

Computers can perform a variety of tasks. They are used for programming, graphics presentation, data management, word-processing, spreadsheets, communications and much more. The ability of computers to do all tasks *i.e.*, processing is built around the two operations of computers – arithmetic operations and logical operations. Functions of computers have been done by software (a set of instructions written by human to computers for processing). Software directs all the processing sequence to the computer and allows it to perform specific tasks. So basic operations perform by any computer are:

(1) Input function

(2) Storage function

(3) Processing function

(4) Output function

(5) Control function

1.4 Computers in Business Organizations

The present computing era is playing important role for the growth of Business Organisations and management of organization. Information Technology is very well designed to improve the growth of business. It is seen that computers are an invaluable assistant for businesses even for small ones also. Information Technology has many dimensions, *e.g.*, mobility.

As business environment is no more as stable as previous era, nowadays much more competitive. So, for the survival of businesses, it becomes mandatory to be techno savvy with full use of IT. Most of the businesses are IT oriented taking help to plan any kind of critical response activities for dealing with today's consumer.

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Due to changed policies of government, Business organizations are under pressure to be IT- oriented over a long period of time. The Government gives enough time to respond to changed policies but changes in the behaviour of the consumers ask organizations to come up with IT solutions fast. So, IT helps us to anticipate and stay ahead of problems. The Organization can be with proactive measures instead of firefighting measures. Business organizations are supported with strategic systems of IT to increase their market value/share.

Nowadays the most need of the Business is Business process engineering (BPR), where IT and computers play a major role. Here, organizations work with the technology of networking. Internet and Intranet are part of networking technique, it helps an organization in changing their processes and reduce cycle time and time to market a product. Employees of the organizations are also accessing information at different levels with the help of IT tools and rising business. So, employees are more independent to take decisions for the business. Through ERP (a major IT tool for business) integration process of an organization is very easy.

Information Technology means gathering, storing, organizing, and displaying of processed data. Here, IT describes an integral part of it as a 'Database'. Database is very important tool of any business organization, which is a collection of related files, tables, relation, data etc. that works for the growth. IT tools help organizations in accessing database and processing of information further for communication and knowledge and facilitates business. So, it can be said that IT is an important tool for the business and must be used properly.

1.5 Generations of Computers

A computer is such an electronic machine, which is present in this world since long. Now we can say that computers passed many generations. Firstly, people know it only as a fast - counting tool. But over the time, computer is characterized by major technological changes or development. The characterized technological developments of computer fundamentally changed the working of computers *i.e.*, the way it operates, stores, processes, and results. Then resulting it to increasingly smaller, cheaper, more powerful, reliable and more efficient as well as multi-tasking device.

These technological development (which are categorical) are recognized as progression of generations with specific changes. So, now we learn about different generations of computers with progressive changes.

1.5.1 *Zeroth Generation Computers*

Zeroth generation of computers can be marked by the invention of first mechanical device Pascaline in 1642. Next in 1822, Charles Babbage, developed Difference Engine for naval navigation. Further in 1834, Babbage attempted to build Analytical Engine, which was considered as first computer. So, Charles Babbage called as father of computers, his computer had memory unit, computation unit, input unit (punched card reader) and output unit (punched output printer), all basic parts of modern computers.

1.5.2 *First Generation Computers*

First generation of computers (1946-1959) was marked with the invention of Vacuum Tubes for circuits and magnetic drums for memory. These computers were very large in size because of the massive number of vacuum tubes required. They consumed too much power and generated too much heat. These systems were very slow with poor reliability and low accuracy. First generation computers were based on machine language for performing operations and using punch cards and paper tapes. They were very expensive also. Examples of these systems are **UNIVAC, ENIAC, EDSAC, EDVAC** etc.

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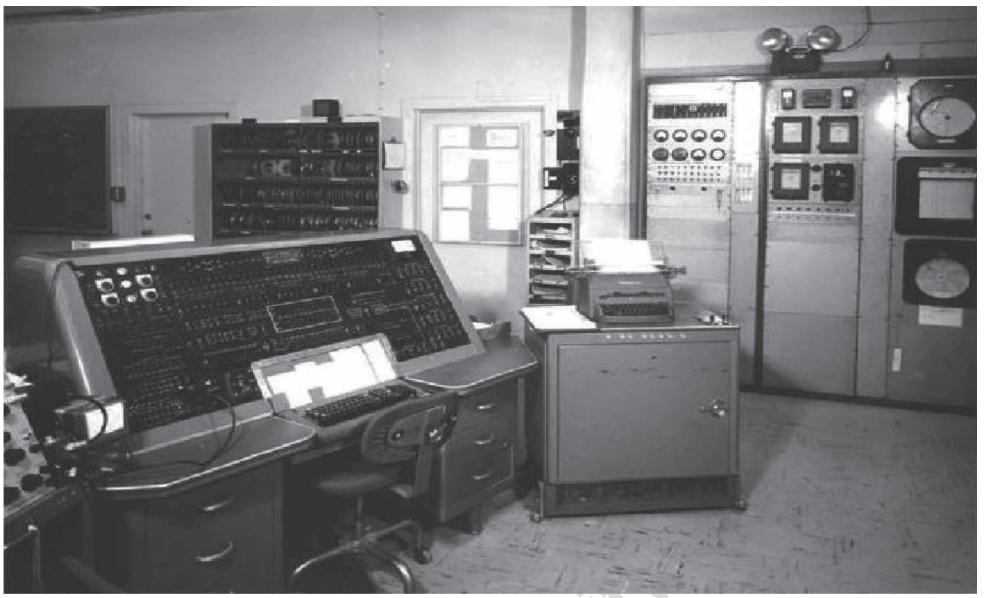

Figure 1.2: First Generation Computers

1.5.3 *Second Generation Computers*

Transistors marked the second generation of computers (1954-1964). Transistors were the breakthrough in the technology of second generation, that make computers small in size and more powerful. The use of transistors made second generation computers less expensive and more reliable, even faster also. Second generation computers moved from machine language to assembly language. They used magnetic core for memory, card readers for input and printers for output. Although, they required less electricity and emitted less heat than earlier computers, but also had many disadvantages. These systems had limited storage capacity, need regular maintenance but much better from first generation. Examples are UNIVAC III, IBM series, HONEYWELL series etc.

1.5.4 *Third Generation Computers*

Third generation of computers (1965-1980) was marked with the use of Integrated Circuits (IC's), a progressive change in technology. This technology was more reliable, more efficient than previous generations. IC's were more compact than transistors, which reduced the size of computers and generated less heat with less consumption of power.

These systems were introduced with operating systems and the concept of computer families. Third generation computers were with secondary storage devices outside the systems. These systems were enabled with faster input/output devices like keyboard and monitor for enhancing the ability. Concept of multiprogramming also introduced and using high level language for programming.

This generation of computers was introduced with some disadvantages like less storage capacity, slow performance as expected. Examples are IBM 360, CRAY-1, PDP-8 SERIES, UNIVAV-1100, 9000 series etc.

1.5.5 *Fourth Generation Computers*

Fourth generation of computers (1981-1995) was the marked generation of Large- Scale Integration (LSI) of chips with several thousand transistors and microprocessors. And further this was followed by Intel series of Microprocessors. This was introduced with very large - scale integration (VLSI) technology for the development of popular personal computers (PCs), also called as Microcomputers. These Microcomputers were introduced for home and business users to adapt computers as part of their working by using word processing, spreadsheet, file handling, graphics, animation and much more. For those purposes, the input/output devices used in fourth generation are very much advanced like graphic tool, animation tools, audio terminals, optical devices etc.

Most importantly, fourth generation introduced with graphical user interface (GUI) and mouse optical devices with very large storage capacity. These systems had very high speed, high level of accuracy and reliability, also diligent and versatile with small size. Examples are CRAY-2, IBM PC/ AT, INTEL 386 SERIES etc., but systems were not intelligent.

1.5.6 *Fifth Generation Computers*

Fifth generation of computers (1995-till date) are enabled with intelligence. Artificial intelligence is the main part of today's systems working with 'Knowledge Processors' (which can find the solution of problem itself).

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They are using IC's with ULSI (ultra - Large - Scale Integration) technology and applications with intelligent software. These systems are more efficient and capable to understand the problem of user, based on intelligent programming and knowledge-based problem-solving techniques. These system performing tasks according to the user intelligently with a specialised technique of AI called as parallel processing. Next goal of this generation is to understand natural language processing and development of such intelligent devices which are capable enough to learn and self - organized.

All this is possible with the help of Internet and Mobile computing, which is again a great achievement of this generation. This era is developing continuously with much more technologies day by day and enabling the world with well performing applications and great devices. That is done only through great human brain, so 'Human Brain' is powerful organ, which is business oriented. Examples are all AI based application or Robots etc.

1.6 Computer Languages

Programming is technical skill of computers which involves designing, creating and refining of code for solving the problems by building applications. For the purpose of programming many computer languages are available for accomplishing the tasks of end users. For understanding computer languages can be categorized as: Low level languages and High-level languages.

1.6.1 *Low Level Languages*

These languages are languages of computer in the form of 0 and 1. They have direct connection with machine, which machine can understand easily based on machine hardware itself. As they very near to machine, so have fast execution speed and efficient use of primary memory but writing of code in low level languages is a tedious task and time consuming.

They are again divided into two: Machine Language and Assembly Language.

1.6.2 *High Level Languages*

High level languages are close to human beings and mathematical notations. These languages require less time and effort in writing code with them. High level languages often use English like words as instructions, but further translate those commands into machine language instructions. To boost the capability of the system they also use assembly language for translation purpose. All high-level languages are different for variety of tasks and specialised for certain purposes. These are categorized according to the specific tasks, examples are as calculation-oriented language (BASIC, FORTAN, ALGOL, and APL), Data processing languages (COBOL, RGL, SQL etc.), List processing language (LISP, PROLOG), object-oriented languages (C++, JAVA, .NET etc.).

1.7 Elements of Information Technology

We have been using and talking about Information Technology, is not an element or a single device. Information Technology is the collection, storage, processing, dissemination, and use of information. It is not only confined to the information, instead a collection of many elements of technology as: Hardware, (Memory units, Storage Units, Processing Units) Software, and Data for processing. But all these elements have to be organized in such a way that each element works smoothly and efficiently. During the computing process, computer integrates all these elements. Thus, computing process includes all elements to accomplish any activity or performing task. All are named and explained as: *hardware, software, data, telecommunications, and people.*

1.7.1 *Hardware*

The term 'Hardware' means the physical parts of the computer, which we can touch. It consists of interconnected electronic devices that controls the system.

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Hardware can be further subdivided into:

- Processing units
- Memory units
- Storage units
- Input/Output units

1.7.1.1 *Processing Unit*

Processing unit is processor, that transforms data into information with the help of memory. Processor act like a brain of the computer, it organizes and process all the instructions given to the system by user. This device is also called as Central Processing Unit (CPU), which involves computations and decision making. It also responsible for controlling all the devices connected. CPU comprises of three parts: *control unit, arithmetic unit and logical unit*, all work with the help of CPU memory called *registers*. CPU works at a very fast pace of sequence *i.e.*, collecting data, transforming data, then generating output; at the rate of one computational cycle at a time. There are many types of processors present in the market for systems based on the working of the CPU.

1.7.1.2 *Memory Units*

The memory of computer is storage medium to store data electronically. It holds the data from CPU and other components of the computer for carrying out its operations. Every computer has certain amount of physical memory (storage space), usually referred as main memory / primary memory. It is a semiconductor device that is built using integrated circuits. Primary memory is internal storage of the computer, where programs and their data stored. This memory provides temporary storage during execution of the program, so also called as volatile memory, but its access is very fast. Some part of the primary memory also contains permanently stored instructions that tell the computer what to do, when it is switched on.

Main memory can be divided into two parts as Random-Access Memory (RAM) and Read Only Memory (ROM). RAM is that part of main memory where data and instruction held temporarily while being executed. It allows user to enter data into the memory and retrieve (read & write) with continuous power supply. On the other hand, ROM is a part of computer storage that cannot be erased or changed (non-volatile) *i.e.*, its

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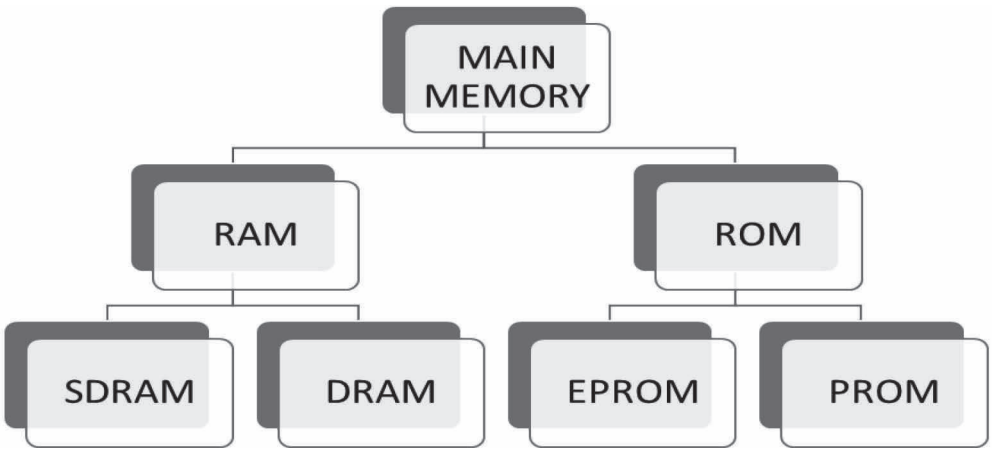

Figure 1.3: Types of Memory Diagram

contents are not lost without power supply. The data can be read only, cannot be write into it. ROM is necessary for the system, which tells or stores booting program to start the computer. This part of the memory is not for application software, only boots the operating system which cannot be changed due to any failure.

1.7.1.3 *Storage Units*

Information needs to be stored on the system with the help of different types of storage media. Storage devices are used to store data permanently or semi-permanently. The data is stored in binary form in memory by storage media. The storage media are distinguished by their relative capacity, speed, and resilience to failure. Broadly, it can be of two types: *volatile storage and non-volatile storage.*

Volatile storage devices need continuous power supply, content will lose if power supply switched off. Access to volatile storage is very fast because of technology used and access method. Examples are main memory, cache memory etc. We have already learnt about primary memory/ main memory or volatile storage in previous section.

Non-volatile storage devices do not need continuous power supply, content will be retained after power supply switched off. The technology used for and access method to non-volatile storage makes them slower than volatile storage. Examples are magnetic storage (disks or tapes), etc. So, further we will learn about secondary storage to store data permanently.

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Secondary storage is non-volatile providing permanent data storage supplements main memory, having much greater capacity than main memory. It is less expensive but slower access than main memory, stores large amount of data permanently. Secondary storage used for keeping backups or archival storage of data. Various technologies are used for access of secondary storage, some provide random access, and others provide sequential access. These technologies effect on speed of data retrieval from then amount of data stored effect on the performance of the storage device. For example, if device having sequential access and it is storing large amount of data then its data retrieval speed will be slow.

1.7.1.4 *Input & Output Units*

For the purpose of communication with the computer and user, medium is required. The collection of devices for input and output of data is called as input/output units. The input is given to the computer through input devices and the display of processed data for the user is provided through the output devices. These devices are controlled by the CPU. Basically, these devices are designed for human beings to interact with computer system in seamless manner. These are links between man and machine, depends on the processing requirement.

Input Devices

The input device is an interface between the user and the machine, for inputting the data and instructions and transformed into machine readable form. Data can be input in many forms such as audio, video, text, graphics, etc. Some common input devices are:

- Keyboard
- Mouse
- Light pens and Digitizers
- MICR
- OCR
- OMR
- Bar Code Reader
- Joystick
- Web camera

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- Voice recognitions
- Scanner

Output Devices

The output device is an interface between the machine and user, that accepts data from the machine and transform into readable format for the humans. The output generated by the computer can be transferred to the user by several devices and media. The output also can be in many forms such as audio, video, text, graphics etc. Some common output devices are:

- Monitors
- Printers
- Plotters
- Audio devices/speakers/headphones
- Projector
- Touch screen
- Braille reader
- Secondary storage devices.

1.7.2 *Software*

The term 'software' means which we cannot touch. Software is interface between computer hardware and users. In the last two decades, there is a great development in the field of software. The computer hardware cannot perform any activity without any instructions; these instructions are given by Software. The software is the set of instructions that hardware units follow to work done. The process of writing the instructions is called the programming, in order to communicate for solving problems. There are many types of software available for almost every type of need. The software available from stores on internet, open source, or paid software. The different types of software are available but broadly classified into two categories: *system software and application software*.

System Software

The system software directly interacts with the computer hardware and manages all the hardware components as well as supervises the execution

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of all applications running on the computer system. It also controls the saving and retrieval of data from the secondary storage devices. Operating system and language translator, utilities are main examples of it.

Application Software

Application software enables the computer to solve the specific data processing task. Application software creates a communication bridge between user, system software and computer hardware to perform specific task. Nowadays, numbers of application software and packages have been developed to make life easier. These are easy to learn and use, although they perform many general and specific functions. However, there may be much kind of situations, where specific types of application software are not available which can be design are called as custom application software. The most important categories or types of packages available are:

- Data Communication Software
- Database Management Software
- Statistical and Operational Research Software
- DTP Package Software
- Presentation and Graphics Software
- Spreadsheet & Word processing Software
- Accounting Packages etc.

1.7.3 *Data*

Data is the basic element of information technology for the business organisations. The modern business runs on data. Business organisations keep their data with the data centres. Data centres is physical place where computer servers, networking, data storage, backup facility, environmental controls etc.

Data is a stream of raw facts, a collection of unprocessed items such as text, pictures, audio, graphics etc. Today organisations are accumulating vast and growing amount of data in different formats and different databases. This mainly includes:

- operational or transactional data such as inventory, sales, cost, payroll, accounting
- non-operational data such as industry sales, forecast data, macroeconomic data
- Meta-data, data about data itself, such as logical database design or data dictionary

Data should be processed before usage; data processing typically is manipulation of data to get information. Data processing activities includes collection of data, conversion or transforming, manipulation or computation, then storage and communication of information.

These activities can be grouped into functional categories, viz., data input, data processing, data output, and storage, is called as data-processing cycle. In other words, data processing is re-structuring or re-ordering of data to increase their usefulness and add values for particular purpose. A data warehouse contains all of the data in whatever form that an organization needs. Databases and data warehouses have assumed even greater importance in information systems with the emergence of "big data," a term for the truly massive amounts of data that can be collected and analysed.

1.7.4 *Telecommunications*

Telecommunication is next component of information technology for working with business organisations. It is the process by which information is

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exchanged, it includes sharing, transformation, or retrieval of information etc. So, conveying and understanding of information is the basic characterized feature of telecommunication. All this is possible only through networking of organisations, and connections can be established physically or by wi-fi connections among themselves. Business organisations follow all basic technologies of networking *i.e.*, LAN, MAN, WAN through wires or wireless with different kinds of hardware.

1.7.5 *People*

Information technology of business organisations is based on important element *i.e.* People. They are main, because of them whole system works. People the important element that are needed to run the system and the procedures, so that data collected in databases and data - warehouses turned into knowledge and information.

People are involved in information systems in just about every way, people imagine information systems, people develop information systems, people support information systems, and, perhaps most importantly, people use information systems.

1.8 Personal Computers in Business

Computers & IT has been impacted tremendous to the Business Organizations. It has many advantages as well disadvantages also. On one hand IT increases labour cost of IT professionals in every field, on the other hand cost-performance ratio of business is towards betterment. Vast capabilities and powers of computers increasing the usage in this field. There are many characteristics of computers, make very useful for Business Organizations such as:—

- data processing speed,
- vast amount of data storage,
- capability to solve complex problems,
- high accuracy,
- automation of tasks, and a
- steady decline of cost of per unit of data processed.

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So, nowadays the IT has been used in every business and for every function or process of business. Some of the basic and popular applications used in business are as follows:

- Finance & Accounting
- Sales & Marketing
- Manufacturing
- Human Resource Management
- Project Management
- Data Analysis
- Marketing & Research
- Healthcare
- Education Sector
- Public Relations etc.

1.9 Planning Information Technology Setup for an Organization

The business organisations, today requires real-time responsiveness to change, whether to meet new demands, changes in the supply chain, or unexpected competitive proceed. In order to be able to respond quickly, enterprises must provide their employees with immediate access to accurate and updated information. This greater vulnerability on information translates into greater dependence on the effectiveness of IT infrastructure as a whole. So, there should be well planned setup of information technology for an organisation.

IT Act as channel of communication, software development tools, and social networks. The responsibility of business organization is, infrastructure should be facilitated, secure, logical, powerful, waste disposable, and management of large chunks of information technology. A flexible and robust IT infrastructure also plays an important role by empower employee productivity and globalization. IT infrastructure allowed pervasive and secure business communications anywhere and anytime and managing operational complexity and providing greater utilization of resource assets. Over the years, computer-based systems are larger and more complex, the

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importance of and dependence on IT systems have grown substantially. Information technology has all the indication of an infrastructural technology. Information technology is, first of all, a transport system. It carries digital information like as railroads carry goods and power grids carry electricity. In IT, companies have worked hard to reduce the cost of IT infrastructure data centre, networks, databases, and software tools that support businesses.

Planning an information technology setup for organisation, proposes an eight-step process that can help decision-makers:

- Choose the solution that best fits their needs and context.
- Obtain the external help and expertise they need.
- Develop, scale, and then sustain their chosen solution.

There are eight steps in the process of planning an information technology setup includes:

- **Define outcomes:** At the start of any major ICT project, the project management team should create a project charter or terms of reference document that summarizes what the project will accomplish and where and when they will implement it. That way, there is no confusion about the project's objectives, targets, and scope.
- **Form your team:** To avoid misunderstandings and to make sure that your team possesses the required skills, consider the roles that will be required. Select personals or organizations that will fulfil these roles. Completing roles and responsibilities, a matrix should be required.
- **Define what your system needs to do:** Defining of business processes first, helps to think about the way people work (or could work) before diving into the details of what your system will look like. This process enhances the likelihood that the system will adapt itself to people and their work objectives.
- **Find the right solution:** Organisation will find an appropriate system solution that aligns with the context, which can be find out by adopting a system and architecture of business organisation.
- **Select right vendors:** It is easy to be overwhelmed by vendors with more experience selling their service or product than business organisation buying it.

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- **Estimate implementation and operational costs:** The cost to maintain the system should provide an ongoing benefit that outweighs this cost. When seeking to manage the cost of operations, the organization should review ways to reduce the cost and best estimate whole cost.
- **Create an implementation plan:** Just as costs are often underestimated, so is the time it takes to implement a successful information system. This sometimes leads to hurried analysis phases, unclear requirement and scope definitions, and skipping necessary quality controls. In the end, this results in even longer timelines. Having a plan and following a project methodology is the key to ensuring success. This step highlights some attention points like define work plan, track milestone then implement.
- **Understand and manage risks of the system:** Following the seven steps described previously should lower project risk by aligning requirements to organizational objectives, understanding costs, planning appropriately, and choosing the right vendors and partners. However, despite the planning that takes place, a significant number of projects have a different outcome than expected. For that just find out critical factor of failure, then solutions to remove or low down the risk.

1.10 Emerging Technologies

Emerging technology generally means a new technology, but it can also meant for the continuing development of an existing technology; it should have slightly different meaning when used in different fields, such as media, business, science, or education etc.

Emerging technologies having importance for the modernization of industries. New technologies work for digitization of business organisations, these technologies are mainly helpful in manufacturing, energy and mobility markets etc. These technologies continue to affect the way we live, work, and interact with one another and having great impact mainly to increase our productivity, make the services we need more accessible, and, overall, make our lives easier.

Emerging Technologies enables learning experiences which are difficult to recreate. They have positive effects (less expense, better efficiency,

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communication networks etc.) and negative effects as well such as social isolation, job loss, health issues, scams etc. So, the main objective of IT is to make tasks easier and to give solutions of many problems. Day by day technology is more emerging, few of the examples of it are artificial intelligence, cloud computing, virtual reality, robotics, social media, machine learning, IoT, big data etc. We will learn here about few of them.

1.10.1 *Cloud Computing*

Recently, cloud computing has been an emerging computing technology of the IT sector, which is acting as a revolutionary set up for the IT infrastructures and provides flexibility to the system. Cloud computing is introduced basically for the business environment that provides internet based interactive environment for using virtualised resources such as storage space, software, working platforms. It has many benefits as resource pooling, on demand benefit, broad network access, location independence, files transfers, software for hire, secure storage, servers for rent, databases. Nothing is there in the world without drawbacks, so some of the disadvantages of cloud computing are less reliable, loss of information, unsecure connections, exposure of your information to many platforms etc.

The major cloud computing models are in use today; **Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS)**. Few of the examples of cloud platforms are **Amazon (Amazon Web Services, or AWS), Microsoft (Azure), and Google (Google Cloud Platform)** maintain the most in-demand.

Cloud computing is emerging on one hand but have many security issues on other hand as lack of privacy, full of legal issues, some compliances, and issue of long term viability etc.

1.10.2 *IoT*

Nowadays Internet is the most important part of the life in the world. So, world is dependent on internet, everything is connected to internet, all communications are with the help of internet, human being are working with internet, almost all devices are connected to internet and performing

task. This gave birth to new term of IoT (Internet of Things), it is an interconnected network of smart devices using internet, sensors, and RFID for transferring data without human intervention over the network.

IoT works on few main elements as identification of device, sensing of data for transferring, then communication of devices to transferring of data. This is the main working of IoT with the world of Artificial Intelligence and Machine Learning. The IoT creates opportunities for new products, services and business models. Some of the basic examples of IoT are: Automotive Industry, Pharmaceutical industry, manufacturing industry, agriculture & breeding, supply chain management, etc.

Some major challenges face by IoT are of security & privacy, scalability & interoperability, low power communication, security threats from devices etc.

1.10.3 *Robotics*

Advancement in AI, machine learning, IoT and big data are driving robots into every aspect of life. Robots can make life easy for humans as by eliminating dangerous jobs for humans because they are capable of working in hazardous environments. They can handle lifting heavy loads, toxic substances and repetitive tasks. This has helped companies to prevent many accidents, also saving time and money. So, from here term ROBOTICS originated.

The main aim of robotics is to design machines that can help and assist humans. Robotics integrates many fields of mechanical engineering, electrical engineering, information engineering, mechatronics, electronics, bioengineering, computer engineering, control engineering, software engineering, mathematics, etc. They need special hardware with sensors and effectors.

1.10.4 *Social Media*

Social media is virtual community within the network, interactive technology that facilitate the creation and sharing of information, ideas, interests, and other forms of expression. In today's society, the use of social media has become a necessary daily activity used for social interaction and access

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to news and information, and decision making. In fact, it is a valuable communication tool, to share, create, and spread information. Social Media is fast evolving as one of the most reliable ways to connect and stay informed about the most recent developments in a particular industry. So, it is very useful for businesses.

1.11 Summary

The computer is an electro-mechanical device, which provides assistance in storing and processing data for business organizations. The personal computers are now in use, which were introduces in 1980's, a computer that is used by single user or people working in same field by sharing. They are so popular, that are used in every working field of the human being – small organisation, large organisation and even in homes. According to the trend, PC's are reducing size, cost but not the performance.

Computers include CPU, input units, output units, storage units and software. The data is entered into the system then transformed into machine readable form is input, then after processing into CPU, data is transformed into human readable form machine is output. Then it is stored into secondary storage permanently. Collection of all these elements is necessary for information technology. So, *hardware, software, data, telecommunication and people* are important elements of information technology to work with business organisations.

So, we have learnt the main components of an IT system that are used in business organisations. They follow the sequential path for installation of PCs into the business organisation with IT setup. These systems are also enables for telecommunications as well as emerging technologies. Today's emerging technologies are including AI, Robotics, cloud, social media etc.

1.12 Self-Assessment Questions

1. Differentiate between High-level and Low-level programming languages?
2. Give examples of High-level languages.
3. What are the limitations of High-level languages?
4. Define Software and discuss its types.

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5. Explain, why people are involved in information systems.
6. Differentiate between input and output devices.
7. Define Information Technology and list its major elements.
8. Discuss how IT is supporting the business organisations.
9. What are the components of a computer system?
10. Differentiate between RAM & ROM.
11. What are the major trends in business organisations for Information Technology enabled PCs/systems?
12. Describe the business benefits of implementing information technology.
13. What are the main types of software and describe their functions?
14. Write a detailed note on the advantages of telecommunication as a component of information technology.

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LESSON

2

Indian Computing Environment

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STRUCTURE

2.1 Learning Objectives

- To gain essential information in the space of the computing environment, which portrays Internet Technology - its key areas, advantages and disadvantages, and ongoing application trends in the IT sector.
- To get fundamental applications of IT in business, government and service sectors.
- To grasp the extent of the effects of IT on the general public, with its benefits and hindrances.

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- To adapt the standards of versatile and remote innovations whose turn of events and applications are turning into the most noticeable parts of the present IT.

2.2 Introduction

Our life has been influenced by Technological development to a reasonable extent that has resulted in the emergence of a replacement of the international economy. It has remodeled the globe into a worldwide village. With a click of a button, the answer to the problem appears on the screen. Despite its excellent use, some flaws must be corrected, or else hackers or any wrong organization will play with the confidential information of many firms or people. That is why it is necessary to grasp the IT idea at ground level to avoid any circumstances of fraud.

Information Technology (IT) is the bedrock of current venture associations. The term rotates on the bottom of computer frameworks, programming, web, and different foundation that empowers an association's center skills. Liberal associations read IT as a superiority that allows them to figure out much intelligence and attain their business objectives.

Our society has modified a good deal owing to the significant advancements within the field of IT that style the standard of our lives, economic processes, education, social relationship, etc. The social group impacts of the IT area deal with each negative and positive aspect. Technology and society go hand in hand and should complement one another. They are the two sides of an identical coin.

2.3 Growth of IT Sector in India

2.3.1 *IT Software and Service Industry*

Information Technology (IT), a knowledge-based sector, has enormous potential to stimulate economic growth, boost overall economic productivity and facilitate effective governance. It improves information access, safeguards consumers, gives people access to government services, increases the effectiveness of skill development and training effectiveness, enhances healthcare service delivery and encourages transparency. It offers excellent employment opportunities and connections between the government and the popular in rural and urban areas. The extent of the

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nation's leading position in the global economy over the next two decades will be determined by investment in knowledge-based businesses.

2.3.2 *Status of IT Software and Service Industry in India*

The Indian IT programming and administration industry has arisen as the quickest developing area in the Indian economy, with a development rate surpassing 50% in commodities and 40% in the all-out IT industry throughout recent years.

India holds a 55% market share of the US$ 200-250 billion global services sourcing industry in 2019-20, making it the top sourcing location globally. India's standing in the 2021 edition of the Global Innovation Index increased by four spots to 46th place (GII). National Association of Software and Service Companies (NASSCOM) reports that the Indian IT sector generated US$ 227 billion in sales in FY22, representing a 15.5% YoY growth. Gartner forecasts that India's IT spending will rise from an estimated US$ 81.89 billion in 2021 to US$ 101.8 billion in 2022. By 2025, it is anticipated that the Indian software products market will be worth $ 100 billion. Indian businesses are concentrating on investing abroad to broaden their global reach and improve their global delivery hubs.

The IT software and service industry has been categorized into three broad sectors:

◆ **Software Product and Technology Services:** It gives the Indian software business a tremendous growth opportunity. The market for developing software products, such as enterprise software (e-business solutions, ERP and e-corporate governance), consumer software (personal productivity tools), and embedded software, is open to Indian enterprises.

Indian businesses have created many highly regarded and well-liked software packages, including HR management and company accounting by TCS, banking automation software by Infosys, ERP tools by RANCO, etc.

◆ **IT Services:** IT Services are transitioning from client-server to the web- and package-based services. This will make up the bulk of the IT services. The most significant opportunity will continue to be in the expansion of IT services, but other areas of the IT software industry will also play a significant role. The need for IT services, domestically and internationally, will increase quickly as new opportunities in management/consulting, application maintenance and Internet services arise. The government, banking and financial services, manufacturing, retail, and distribution are the primary consumers of IT services.

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Communication, healthcare, and utilities are likely to experience new developments due to the deregulation of these industries. However, top-notch personnel, cutting-edge abilities, a top-notch telecom environment, and an environment based on IT knowledge are fundamental requirements for IT services.

◆ **IT Enabled Services (ITES):** The Indian ITES sector has established itself as a significant growth driver for the country's IT sector and technology-driven services sector. Seventy thousand people are employed in this sector, which grew from Rs. 2,400 crores in 1999–2000 to Rs. 4,100 crores in 2000–2001.

It includes a wide range of services, some of which include:

- Call center and other customer-interaction services.
- Back offices, revenue accounting, data input, data conversion and HR services.
- Transcription and translation services.
- Animation and content creation.
- Additional services include network consulting, market research, GIS, data search and remote education.

ITES has significant employment potential and a shorter gestation period than other IT-related industries. It demands consistent performance with high-quality standards and a lot of human resources.

IN-TEXT QUESTIONS

1. What is the position of India in the Global Innovation Index 2021?
2. Economic trends include information relating to:
   (*a*) Consumer and employment
   (*b*) Productivity, capital investment, etc.
   (*c*) All are true
   (*d*) None is true

2.4 Trends in IT and ITES Sector

The IT industry is constantly evolving. This quick-changing business has many new technologies, tools, software frameworks and creative concepts. In the present IT world, the development of every economy is connected with the development of Data Technology. The data innovation industry

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is encountering a blast more than ever, which is just the beginning; more brands are hoping to extend in this space.

The world's basic structure has changed due to the COVID-19 epidemic. The virus started in China in late December 2019 and has since spread to every continent and infected millions of people. Global economies have been shut down in response, and various degrees of lockdowns have been encouraged. One of the strictest lockdowns, prohibiting the flow of people and products and essentially turning every city into a ghost town, has probably been in place in India.

The economy has been dealt a deadly blow due to such onerous limitations on movement. When the virus entered India, the nation was already experiencing difficulties due to a falling GDP growth rate and a widening fiscal imbalance. The lockdown has only made the financial situation worse, driving several enterprises and industries into a condition of moribundity. Other nations have seen a comparable situation, especially in the US and Europe, which were both centers for virus transmission.

However, a closer examination of the global economy reveals that several IT-related sectors appear to have experienced an upward mobilization. These industries appear to have substantially expanded their operational footprint and generated sizable revenues.

If we examine how the global IT/ITES market is developing, we can see that all areas that have succeeded throughout this challenging period have one thing in common: Adaptability. These industries have chosen a more adaptable strategy for handling the lockdown. They have not been afraid to alter the game's rules, whether through flexible working practices or the adoption of newer, more technologically advanced working methods in keeping with the demands of our day. Let us examine a few of these tech-related fields that have been successful in overcoming the shutdown.

◆ **Artificial Intelligence and Machine Learning:** AI (Artificial Intelligence) and Machine Learning (ML) are closely related fields that focus on creating systems capable of performing tasks that typically require human intelligence. Here are some key points about both:

AI refers to the simulation of human intelligence in machines that are designed to think and learn like humans.

We have three types of AI:

Narrow AI: Specialized in one area (e.g., speech recognition, self-driving cars).

General AI: Aims to replicate human cognitive abilities across various tasks (currently theoretical).

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Applications:

Natural language processing (NLP)

Computer vision

Robotics

Expert systems

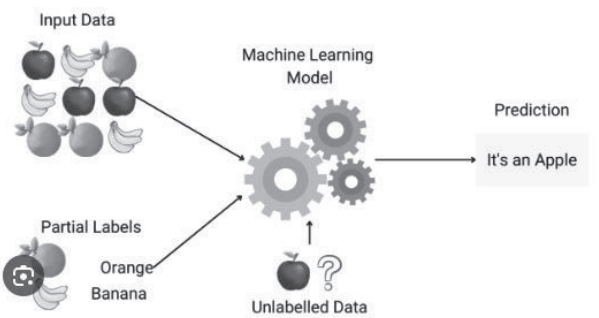
Autonomous systems

Machine Learning (ML)

ML is a subset of AI that involves the use of algorithms and statistical models to enable computers to learn from and make predictions or decisions based on data.

Different types of ML algorithms include:

Supervised learning is a type of machine learning where an algorithm is trained on a labeled dataset. In this context, "labeled" means that the data comes with corresponding correct answers, often referred to as "labels."



The algorithm is given a dataset where each input (or feature) has a corresponding output (label). For example, in a dataset used to classify emails as spam or not spam, each email (input) would be labeled as either "spam" or "not spam" (output).

The primary objective of supervised learning is to learn a mapping function from the input to the output so that the model can predict the output for new, unseen data. This is done by minimizing the difference between the predicted output and the actual output in the training data.

We can use supervised learning for both classification and regression. Classification means predicting the group to which an item belongs. For example, whether a given image is a cat or a dog. Regression, on the other hand, means predicting a particular value. For example, the prices of a house based on its features like size, location, and number of rooms.

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Supervised learning is widely used in various applications, including email filtering, fraud detection, and image recognition.

Commonly Used Supervised Learning Algorithms:

Linear Regression: Used for predicting continuous values, such as housing prices.

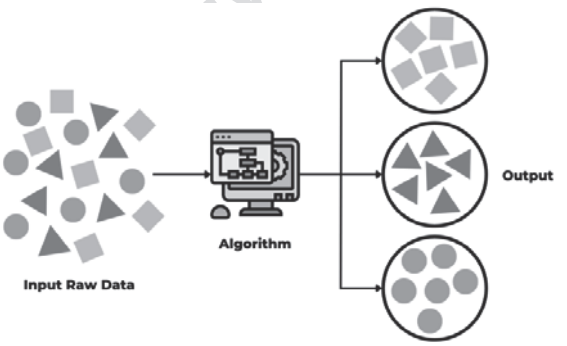
Logistic Regression: Used for binary classification problems, such as determining whether an email is spam or not.

Decision Trees: Used for both classification and regression tasks.

Support Vector Machines (SVM): Used for classification tasks by finding the hyperplane that best separates the classes.

Neural Networks: Particularly deep learning models, which are used for complex tasks such as image and speech recognition.

Unsupervised learning is a type of machine learning where the algorithm is trained on data that is not labeled. Unlike supervised learning, where the model learns from input-output pairs, unsupervised learning works with data that only has input features and no corresponding output labels.



The data provided to the algorithm consists of input features without associated labels or outcomes. The goal is for the algorithm to identify patterns, structures, or relationships within the data.

The main objective is to find hidden structures or patterns in the data. This can involve grouping similar data points together, reducing the dimensionality of the data, or discovering the distribution of data points.

Common Algorithms:

Unsupervised learning is valuable when the goal is to explore the data and identify patterns without the need for labeled examples, making it particularly useful in exploratory data analysis and when

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labeled data is scarce or expensive to obtain. Some commonly used unsupervised algorithms include.

Clustering: Algorithms like K-Means, Hierarchical Clustering, and DBSCAN are used to group data points into clusters based on similarity.

Dimensionality Reduction: Techniques like Principal Component Analysis (PCA) and t-SNE reduce the number of features in the dataset while preserving as much variance as possible.

Association: Algorithms like Apriori and Eclat are used to find rules that describe large portions of the data, such as in market basket analysis (e.g., if a customer buys bread, they are likely to buy butter as well).

Examples:

Clustering: Grouping customers based on their purchasing behavior to identify distinct customer segments.

Dimensionality Reduction: Reducing the complexity of a dataset with many features, such as in image compression, where an image with thousands of pixels can be represented with fewer features.

Anomaly Detection: Identifying unusual data points in a dataset, such as detecting fraudulent transactions in a set of financial records.

Applications of Unsupervised Learning:

Customer Segmentation: Grouping customers based on purchasing patterns for targeted marketing.

Anomaly Detection: Identifying outliers in data, such as detecting fraud or network intrusions.

Data Compression: Reducing the size of datasets while retaining important information, useful in image and signal processing.

Market Basket Analysis: Identifying associations between products in retail to improve cross-selling strategies.

Reinforcement learning is a type of machine learning where an agent learns to make decisions by interacting with an environment to achieve a goal. The agent takes actions based on the current state of the environment and receives feedback in the form of rewards or penalties, which it uses to learn the best strategy or policy over time.

Key Aspects of Reinforcement Learning:

Agent: The decision-maker or learner in the environment which interacts with the environment by taking actions.

Environment: The world or system with which the agent interacts. It provides feedback to the agent based on its actions.

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State: A representation of the current situation or status of the environment. The state provides the context for the agent's decision-making.

Action: The decisions or moves the agent can make at any given time. Each action leads to a transition to a new state in the environment.

Reward: A numerical signal given to the agent after it takes an action, indicating the immediate benefit or cost of that action. The goal of the agent is to maximize its cumulative reward over time.

Policy: The strategy or rule the agent follows to decide which action to take in each state. The policy maps states to actions and evolves as the agent learns from its interactions.

Value Function: A function that estimates the expected cumulative reward an agent can achieve starting from a particular state or state-action pair. It helps the agent evaluate the long-term benefit of its actions.

Exploration vs. Exploitation:

Exploration: The agent tries out new actions to discover their effects and improve its knowledge of the environment.

Exploitation: The agent uses its current knowledge to make the best decision and maximize its reward based on past experiences.

Learning Process:

Trial and Error: The agent learns through a process of trial and error, exploring different actions and observing the resulting rewards.

Feedback Loop: The agent continuously updates its policy based on the rewards received, refining its strategy to maximize long-term rewards.

Types of Reinforcement Learning:

Model-Free Reinforcement Learning: The agent learns directly from its interactions with the environment without any knowledge of the environment's dynamics. Examples include Q-Learning and Deep Q-Networks (DQN).

Model-Based Reinforcement Learning: The agent builds a model of the environment's dynamics and uses it to plan and make decisions.

Common Algorithms:

Q-Learning: A model-free algorithm that learns the value of actions in states, allowing the agent to choose actions that maximize its cumulative reward.

Deep Q-Network (DQN): A deep learning extension of Q-Learning that uses neural networks to approximate the value function.

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Policy Gradient Methods: Algorithms like REINFORCE and Proximal Policy Optimization (PPO) that optimize the policy directly by maximizing the expected reward.

Applications of Reinforcement Learning:

Gaming: Training AI to play games like chess, Go, or video games at a superhuman level (e.g., AlphaGo by DeepMind).

Robotics: Teaching robots to perform complex tasks such as walking, grasping objects, or navigating environments.

Autonomous Vehicles: Enabling self-driving cars to learn how to drive by interacting with real or simulated environments.

Finance: Optimizing trading strategies by learning from market data and making decisions that maximize returns.

Example:

A classic example of reinforcement learning is training an AI to play a video game. The agent (AI) interacts with the game environment by making moves (actions), such as jumping or running. If the agent completes a level or avoids an obstacle, it receives a reward. Over time, the agent learns which actions lead to higher scores and improves its gameplay strategy.

Reinforcement learning is powerful for problems where the optimal solution is not known in advance and must be discovered through interaction with the environment. It is particularly effective in scenarios that involve sequential decision-making and long-term planning.

Recent Trends

Deep Learning: A subset of ML that uses neural networks with many layers (deep neural networks) for high-level abstractions in data.

Transfer Learning: Leveraging pre-trained models for new tasks.

Explainable AI (XAI): Developing AI models that provide understandable and transparent decisions.

AI Ethics: Addressing the moral implications and societal impacts of AI, including bias, privacy, and job displacement.

Artificial intelligence and machine learning have taken center stage in recent years in terms of new information technologies. Many multinational companies have started integrating AI and ML into their operations, reaping noticeable advantages, including enhanced customer experiences, faster business processes, fewer production concerns and increased profits.

'Semrush' figures show that 86% of CEOs expect AI to be standard technology in their workplace by 2021. Moreover, in 2022, the tendency will continue

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to pick up speed. More SMBs will ensure that their development approach includes deep learning, machine learning and artificial intelligence.

Intelligent tools and algorithms will increase across various industries, including manufacturing, healthcare, finance and education. Businesses that disregard or delay implementing AI within the next five years run the danger of going out of business.

◆ **Social Media:** Social Media is a web-based connection among people. It permits clients to have discussions, share data and make web content. There are many types of web-based entertainment for everyone's taste, including online journals, miniature sites, wikis, informal communication destinations, photograph sharing, texting, video-sharing sites, digital recordings, gadgets and virtual universes. Lockdowns worldwide have kept people stuck at home with nothing to do. As a result, the social networking site reported a spike in user engagement during the lockdown period.

◆ **Data-Mining Enterprises:** The lockdown has made all the difference for information mining organizations. This restrictive expansion in the number of hours spent on web-based and online platforms all over the planet has given these organizations admittance to more extensive information arrangements than they could have imagined.

◆ **Cloud Computing:** Cloud computing has been rising for the last couple of years as the pandemic has made it the *de facto* king of computational services. With a rising dependence on remote working, the capacity to store information in one secure area has become essential.

◆ **E-Commerce:** Social isolation measures have made it unimaginable for individuals to genuinely go out to shop for food and different necessities because of the apprehension about the transmission of the infection. Online businesses have been the genuine victors in this dilemma of worldwide commercialization. With only expectations of cleanliness and at-home conveyance, these locales have given a simple choice to retail locations.

◆ **OTT (over-the-top) Platforms:** Web-based streaming stages like Netflix, Prime, and so forth comprise a generally more current way to deal with diversion. They had, as of now, in any case, laid out a name for themselves before the lockdowns and became worldwide famous for the wide variety of shows and movies among a large set of different aged populations.

◆ **Video-Conferencing Platforms:** We need everything over the Internet, and nobody wants to go out. In the current scenario, this fact is transforming

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into the new norm in our master culture: Learning, family meetings, etc. Also, this "Work from Home" culture is preferred over full-time office jobs in the current scenario. Sound or text, yet video conferencing is the need today.

◆ **Mobile Apps:** Mobile Apps and Portable applications have just filled in omnipresence and popularity throughout recent years. This year, they are surfacing in far superior ways by executing new assets that can make chipping away at the go more effective.

◆ **Automation:** Automation is a pattern that is essentially catching assembling and creation areas and is supposed to increment further before long. Computerization has likewise empowered cycles to work quicker, easing the human workload.

◆ **Artificial Intelligence:** The previous year saw the presentation of a few new mechanisms of man-made reasoning. This year, enterprises are taking different steps and measures by which they can develop these assets and carry out their work. Man-made intellectual prowess is, as of now, seeing execution for a greater degree, which is set to foster more all through the following couple of years.

◆ **Virtual Reality:** The gaming business has forever been one that has encountered development close to the field of data innovation, and computer-generated reality has made this one stride further, giving clients the actual encapsulation of advanced insight. Computer-generated reality gaming has previously become well known because of innovation, which works on how the business can develop.

◆ **Cyber Security:** With the development of computerized mediums and innovation, the potential dangers that individuals can confront are just rising. Because of this, cybersecurity and network safety has needed to develop broadly throughout recent years. Industries all around the world likewise understand the significance of putting resources into network protection, which is why the field is experiencing growth at such a rapid pace.

◆ **Growth of IoT Networks:** The Internet of Things is the idea that all computerized gadgets are associated with a solitary medium through which one would have the option to control everything. More brands are starting to consolidate this idea encountering development at such a quick speed

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so that they can gain more and more profit as the idea of IoT is becoming vaster and vaster these days.

◆ **Rise of Chatbots:** Chatbots are a program to respond to detailed inquiries somehow or another and are planned to help clients with a piece of the more fundamental capacities they would require. These are, clearly, still not in a position wherein they are a complete substitute for genuine live client care, which has assisted them with the remaining development.

Also, there are a lot more fields like those referenced previously. The end here is that it is inevitable that the IT business, regardless of its overall youthfulness and more settled areas, will stay a central participant in the country's financial scene and continuous development and evolution.

IN-TEXT QUESTIONS

3. ITES refers to:

(*a*) Information Technology Enabled Services

(*b*) Information Technology end Services

(*c*) Information Technology enabled Server

(*d*) None of the above

4. A type of _____ based computing is cloud computing.

(*a*) Iot

(*b*) Internet

(*c*) Bluetooth

(*d*) Big data

5. Full form of VR is _____.

2.5 Applications of Information Technology in Business and Service Organizations

With more advancements in innovation, new organizations are made. With more business, innovation acts as the hero by making things simpler. The two exist in something of a co-operative relationship that guarantees they will continuously coincide or coexist. The role of Information Technology in the business environment is ever-increasing. The application of IT is beneficial and profitable to organizations.

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2.5.1 *What is Information Technology?*

Information Technology (IT) integrates the review and usage of PCs and any kind of transmission correspondences that store, recover, study, pass on, control information and send data. Data innovation includes a blend of equipment and programming to play out the fundamental errands and the role that individuals need and use on an ordinary premise.

There are many facets of Information Technology which are listed below:

- **Governance:** It refers to how working units implement operational boundaries and how individuals use engineering, organizations and IT frameworks. In plain English, they approve the guidelines for how our group, and we may use the organization's invention and the purposes for which we may do so.

  Similar to information affirmation, which the IT office is also capable of, this is crucial for traditional IT security. The actual parts of Information Technology go under the equipment of IT. It incorporates setting up and keeping up with the hardware like telephone frameworks, switches, servers and PCs.

- **Infrastructure:** It alludes to any tangible elements required for an IT system. Depending on the requirements and size of the business, it includes hardware, network and circuits of the equipment.

- **Functionality:** It is conceivably the most significant and practical work an IT department performs, and for this reason, other departments within a company take notice of and remember an IT department.

  It includes designing and managing operational applications, creating, protecting, and storing the organization's electronic data, and aiding all functional areas of the company with software and data management.

The creation and management of communications networks for small and large enterprises are centered in the IT department. The importance of an effective IT department to a company's day-to-day operations can be seen in the fact that few businesses, large or small, could operate without one. Information Technology assists every step, from sending an email to changing a password, accessing databases, and everything in between. The ultimate goal of IT in a company is to increase productivity and efficiency.

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2.5.2 *Information Technology in Business*

Every business plan now includes information technology (IT) as a crucial and vital component. IT is used by various organizations, including tiny enterprises with one computer and multinational corporations that manage mainframe systems and databases. The easiest way to understand the drivers behind computer technology's pervasive use in business is to examine how it is applied globally.

◆ **Data and Information Security:** The primary objective of safeguarding is to keep data secure. The IT division will guarantee confidential information. To prevent crucial data from being corrupted, compromised or lost, IT must also ensure they adhere to data protection rules. Its criticality has further increased globally with the implementation of the "General Data Protection Regulation" by European Union.

Examples of data breaches include information theft by hackers or data safeguarding, which means that industry-standard security measures are in place throughout the entire organization to guard against the loss, misuse, unauthorized disclosure, alteration, or destruction of data related to the company or **team member** the misuse or sharing of personal information about a company's personnel.

◆ **Investigation of Issues:** In the digital sphere, problem-solving is referred to as troubleshooting. Repairing malfunctioning digital items or processes on a PC or system is one example of how troubleshooting can be used. When a problem is troubleshot, a methodical and logical search is done for the problem's cause to fix it and restore the process or product to full functionality. When something is incorrect, troubleshooting is also utilized to determine the symptoms.

◆ **Database maintenance and security:** The era of massive file rooms, rows of filing cabinets, and document shipping are quickly passing by. Most businesses now keep digital copies of their documents on servers and storage gadgets. Everyone has immediate access to these documents, no matter where they are located within the firm. Employees profit from quick access to the papers they need, and businesses can store and manage a vast amount of historical data inexpensively.

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◆ **Controlling cloud-based solutions:** A cloud-based solution is an on-demand service for nearly anything and everything we can "store," such as computer network data, storage, programs, or resources accessed through the Internet and an outside provider's shared cloud computing infrastructure (servers accessible over the Internet). Cloud-based solutions are used by both large and small businesses, from the neighbourhood candle store to worldwide industry leaders like Microsoft and Google, to maintain control over their virtual or physical offices and staff members.

◆ **Examine data:** Specific data may be analyzed by information technology, and using the trends and facts in the data, can assist in planning the organizational journey appropriately. IT can effectively provide organizations with a wide range of tools to help them plan their future growth and overcome complex business challenges. Nowadays, with everything moving online and people having constant access to the Internet *via* their smartphones, businesses cannot survive without digital marketing. The global market can be reached by firms using the Internet's digital marketing platform, which they can access from the convenience of their own home or remote office.

◆ **Effective Communication:** We live in a time where we can often get in touch with a company immediately. Understanding a customer's demands, purchasing trends, behaviours, and satisfaction levels is crucial to a business's success. Adequate and prompt communication is ideal for handling consumer requests, issues and solutions. The beauty of information technology is that it enables companies to interact instantly and globally with millions of clients. Through IT, clients may communicate in a plethora of ways without ever leaving their homes. These channels include emails, social media conversations, video calls, webinars, member forums, email newsletters and smartphone access.

2.5.3 *Information Technology in Service Organization*

The service industry is impacted by the market's increasing competitiveness and emphasis on client satisfaction. Following the conventional approach, nevertheless, does not always work for such situations. As a result, technology is increasingly being introduced to enhance the consumer experience. Many companies have been encouraged by the role technology plays in the service sector to cut back on wasteful costs and uncertainty. Additionally,

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by minimizing client interaction, the influence of technology on the service sector has been utilized to standardize the services.

More than only service automation and lower-cost service delivery are benefits of technology's entry into the service sector. Additionally, it allows us to collect, examine, and use client information to understand their wants better and satisfy them. Technology is defining not only the trend of consumer wants but also the ability of staff to receive and give their clients personalized service.

As is apparent, technology has been the main driver of innovation in the service industry. Because of emerging technology, automated voice mail, interactive voice response systems (IVR systems), fax machines, ATMs, and other commonplace devices are conceivable.

◆ **Quick access to services:** Incorporating technology into services makes the task easier and provides customers with speedy and dependable service. Every stage of the process may be automated, improving the entire customer experience while saving time and human labour. Thanks to technology, a wide range of services are now at clients' fingertips.

Access to any information is made simple by the digital transition. Customers may hunt for any service by conducting a simple Internet search on their smartphone. Consequently, we may use the search to get all relevant results and even save time.

◆ **Improved Method of Service Delivery:** Every person, whether a buyer or a merchant, eventually has to adjust their everyday tasks. The utilization of technology is now coming. It could improve the interactions between service users and providers. Given the widespread adoption of technology, it is reasonable to state that technology makes it easier to do fundamental customer service tasks like paying bills, getting information, reviewing financial records, monitoring shipments, etc. However, the emergence of automated voice response systems has enhanced the sector's customer service. Similar to how technology has advanced and affected nearly every industry, delivery services have also undergone significant changes.

◆ **Friendly Interactions with Customers:** Companies in public and private sectors are heavily utilizing technology and working hard to develop friendly relationships with their clients. Distribution of products businesses frequently set up order terminals, inventory management terminals, and other technical

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devices on their client's premises. This offers the consumer a wonderful experience and helps the business incorporate a customer relationship.

Every firm offers a range of facilities and services to help its clients advertise their businesses. However, thanks to technology, customers may now get services right at their doorstep without any wait time or line-ups.

◆ **Services' Global Reach:** The customer's ability to access services globally has significantly grown with the introduction of technology in the service sector. The Internet is a vast network that crosses all geographical boundaries and links every person to the services offered. Access to the Internet enables international travel and the conveyance of information, customer service and global transactions. Thanks to technology, people may work from home for any multinational corporation. Client living has increased significantly as a result of the technology-based service.

◆ **Great Service Quality:** Thanks to technology, a specific consumer may get services that are tailored to their needs. This forges strong customer ties and fosters trust in the business and its offerings. Customers are more dependable when using technology to get services than manual access since services are easy to access and of high quality.

2.6 E-Commerce: A Web-based Business

Web-based selling has changed immensely since it started; the advancement and history of e-commerce, also known as an online business in simpler terms, is interesting – and it is progressing at an even rapid speed today. E-commerce is trading labour and products utilizing the web and exchanging cash and information to finish deals. It is otherwise called electronic trade or web business. E-commerce mainly evolved during the pandemic, enabling businesses to survive and thrive. Unlike a brick-and-mortar store, running an e-commerce store does not require us to spend much money on overhead, and we can reach a global audience.

2.6.1 *Introduction*

E-commerce works just like how a physical store works. Customers search their individual choice of e-commerce stores; browse various products they want to buy and finally make a purchase. The significant distinction is that they do not must get off their sofa to do so, and the purchaser base is not restricted to a selected geographic place or region. These web applications

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follow specific steps to sell their products to the customers. Those steps are as follows:—

1. **Accept the order:** As soon as the customer places an order, the e-commerce site will be alerted of an order being placed. The alert description will show the details of the respective order, like the product name, company name, quality, quantity, etc.
2. **Process the order:** Next, the charge or payment is processed, the sale is logged, and the order is marked complete. Payment transactions are typically processed *via* what is referred to as a payment gateway which contains various modes for a payment to happen.
3. **Ship the order:** Shipping a product is considered the last step in this process. It is to be ensured that the products are delivered to their correct and respective addresses. The duration of the delivery process depends on the location.

There are various examples of e-commerce businesses such as Online retail, Wholesale, Drop shipping, Subscription, Digital Products, Physical Products, and Services. Companies such as Amazon, Flipkart, Lenskart, Myntra, MakeMyTrip and many more provide e-commerce facilities.

2.6.2 *E-commerce Business Models*

There are various online business plans because of what is sold and to whom. These are the three most ordinary and everyday models:—

1. **Business to Consumer:** This business sells items or administrations straightforwardly to the consumer. The B2C e-commerce business is the most well-known web-based business type and covers an expansive cluster of items, from clothing to daily needs. Instances of B2C web-based business stores incorporate Amazon, Netflix and Overstock.
2. **Business to Business:** When a business offers items or administrations to another business on the web, it is viewed as B2B online business. These organizations could sell things like office supplies, furniture and gear. They also give online business arrangements, such as archive marking programming and other cloud-based administrations.
3. **Marketplaces:** Marketplaces or internet business commercial centers are sites where outsider shippers can offer their items or administrations to consumers. Walmart.com and Etsy are different instances of online Marketplaces. For a cut of the deal, we can list our items on their website and access their client bases.

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2.6.3 *Pros and Cons of e-commerce*

As we know that every technology is not perfect. It can be almost perfect but will have minor flaws. Let us examine some pros and cons of e-commerce trading.

Table 2.1: Pros and Cons of e-commerce

Pros	Cons
1. It has fewer overhead costs than an actual store.	1. Lacks customized sales and personal touch.
2. Compiles client information.	2. Information, Debit and Credit card extortion are widespread.
3. It can be operated 24x7, with no staff.	3. It offers limited loyal customers.
4. The business can scale on the fly.	4. There are expenses for carrying on with work on the web.
5. It has proven to be pandemic resilient.	5. Web-based business is a ferocious business.
6. It is not difficult to follow the sales and shipments.	6. Clients need quick, free delivery.

IN-TEXT QUESTIONS

6. E-commerce is also known as:

(*a*) Electrical Commerce

(*b*) Electronic Commerce

(*c*) Entertainment Commerce

(*d*) Electrochemical Commerce

7. Which E-commerce category includes businesses like Flipkart, Amazon and Myntra?

(*a*) B2B

(*b*) B2C

(*c*) P2P

(*d*) C2B

8. The idea of online marketing and purchasing goods and services is _____ E-commerce.

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2.7 E-Governance: A Smart Administration

Electronic governance or e-governance suggests government working with the use of ICT (Information and Communications Technology). Thus e-Governance is fundamentally a move towards SMART administration, inferring: Straightforward, moral, responsible, responsive and transparent administration. For this reason, a comprehensive resident administration portal should be set up, with so many administrations like the issuance of general declarations, administrations related to charges, income, transport, permits and licenses, enlistment of various types, benefits plan, the government managed retirement and government assistance plans, instruction preparation, work, lodging, foundation, monetary help plans, businesses, horticulture, and other various administrations. This will not just assist in carrying out e-governance smoothly but will likewise teach and make an IT culture in the perfect state. There are four types of E-Governance interactions:

1. **G2C (Government to Citizens):** It refers to interaction between the government and the citizens. The Digital India programme, the National Portal of India, the Prime Minister of India portal, Aadhaar, online tax filing and payment, digital land management systems, Common Entrance Test, etc. are some examples of e-governance with relation to the G2C.
2. **G2B (Government to Business):** It is an interaction between the business community and government using e-governance tools. A government website where businesses go to pay taxes is a prime example of G2B.
3. **G2G (Government to Government):** It refers to interaction between various government entities. Example of G2G is the Bhoomi Project. A self-sustaining e-government initiative called Bhoomi automates the distribution of 20 million rural land records to the 6.7 million farmers in Karnataka. The "Bhoomi" project was taken on and developed by the Karnataka State Government. In order to computerize all of Karnataka's land records, this was done. The State Government of Karnataka and the Ministry of Rural Development of the Indian Government, however, both co-sponsored the programme.
4. **G2E (Government to Employees):** Interaction between the government and its employees. E-Mitra, E-Seva project, CET (Common Entrance Test), etc are some examples of the G2E governance.

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2.7.1 *Promoting E-Governance*

There are some steps taken to promote e-governance in India are as follows:

1. In 1998, A National Task Force on Information Technology and Software Development was set up to promote digital plans that will benefit the future.
2. The Ministry of Information Technology was formed at the Center in 1999.
3. A 12-point plan was recorded for e-Governance for execution in everyone of the focal services and divisions.
4. The Information Technology Act (2000) was authorized. This Act was corrected in 2008.
5. The primary National Conference of States' IT Ministers was co-ordinated in 2000 for showing up at a Common Action Plan to advance IT in India.
6. The government set up NISG (National Institute for Smart Government), where they can train the officials to use digital platforms.
7. The state legislatures sent off e-Governance projects like e-Seva (Andhra Pradesh), Bhoomi (Karnataka, etc.).
8. The National Policy on Information Technology (NPIT) was embraced in 2012.
9. The National e-Governance Plan (NeGP) was launched, consisting of 31 Mission Mode Projects (MMPs) and eight support components. This project gives a comprehensive perspective on e-Governance drives across the nation. Around this thought, a monstrous countrywide foundation arriving down to the remotest of towns is developing, and colossal scope digitization of records is occurring to empower simple, dependable access to the web. The government has proposed to carry out "e-Kranti: National e-Governance Plan (NeGP) 2.0" under the Digital India program.

2.7.2 *E-Kranti: Electronic Delivery of Services*

E-Kranti is a fundamental mainstay of the Digital India drive. Considering the essential requirement for E-Governance, portable governance, and excellent governance in the country, the methodology and critical parts of E-Kranti have been supported by the public authority and approved by the government. The E-Kranti structure tends to the electronic conveyance of

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administrations through an arrangement of mission mode projects that cut across a few government divisions.

Objectives of E-Kranti:—

1. Rethink NeGP with groundbreaking and result-arranged e-Governance drives.
2. Improve the arrangement of resident-driven administrations.
3. Guarantee ideal use of center Information and Communication Technology (ICT).
4. Advance quick replication and mix of e-Governance applications.
5. Influence arising advancements.
6. Utilize more co-ordinated execution models like agile implementation.

2.7.3 *Advantages of E-Governance*

1. Develops conveyance and productivity of taxpayer-driven organizations.
2. Developed government connections with business and industry.
3. Resident strengthening through admittance to data.
4. More efficient government administration and high transparency among officials.
5. Cost decreases and income increases.
6. Expanded authenticity of government.
7. Diminishes desk work and red-tapism in the authoritative cycle, which brings about better preparation and co-ordination between various degrees of government.
8. Developed relations between the public specialists and everyday society.

IN-TEXT QUESTIONS

9. E-Governance is a technology that progresses:

(*a*) Accountability

(*b*) The efficiency of government processes

(*c*) Transparency

(*d*) All of the above

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10. E-Governance has four types of interactions, namely:

(*a*) E2G E2E E2W E2B

(*b*) G2C G2B G2E G2G

(*c*) G2A G2R G2W G2G

(*d*) G2E G2G G2P G2R

11. The National Policy on Information Technology (NPIT) was embraced in _____.

12. The idea behind e-Kranti is:

(*a*) More crop per drop

(*b*) One-stop service center

(*c*) Changing the face of Rural India, electronic way

(*d*) Transforming e-Governance for Transforming Governance

2.8 Latest Developments in Information Technology

Technology is quickly developing. More technical evolution is notably made possible by developments in information technology such as artificial intelligence, geotargeting, automation and others. Even our thermostats and refrigerators can be connected to the Internet as robotics become smarter. Some of the advancements are stated below:—

1. Data Science

Data science is the study of data to extract meaningful insights for business. It is a multidisciplinary approach that combines principles from different fields including mathematics, statistics, artificial intelligence, and computer science to analyze large amounts of data. This analysis helps to find answers like what happened, why it happened, what will happen, and what can be done with the results.

Data science is used to study data in four main ways:

Descriptive Analysis: It helps users to examine data to gain insights into what happened or what is happening. For this, charts are made to visualize data. For example, a flight booking service recoding the number of tickets booked each day can be used to reveal booking spikes, booking slumps, and high-performing months for this service.

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Diagnostic Analysis: It includes detailed data examination to understand why something happened. This is done by techniques like drill-down, data discovery, data mining, and correlations.

Data can be also transformed using various operations to discover unique patterns. For example, continuing with the flight service example, users can drill down on a particularly high-performing month to better understand the booking spike. This may help the user to understand that many customers visited a particular city to attend a particular monthly sporting event.

Predictive Analysis: This analysis use historical data to accurately forecast patterns that may occur in the future. Predictive analysis employs techniques including machine learning, forecasting, pattern matching, and predictive modelling. These techniques are trained on data to reverse engineer causality connections in the data. For example, the flight service team may predict flight booking patterns for the next financial year by analyzing the past data. This would help the company to start targeted advertising much ahead in time.

Prescriptive Analysis: Prescriptive analytics takes predictive data to the next level. Besides predicting what is likely to happen, it also suggests an optimum response to that outcome. For this, it analyses the potential implications of different choices to recommend the best course of action. For example, the flight booking system could look at marketing campaigns done so far to maximize the advantage of the upcoming booking spike. This would help to understand the amount to be spent on different marketing channels.

2. Full Stack Development

One of the most popular and in-demand technologies of 2021 will undoubtedly be full-stack development, which refers to creating both client-side and server-side software.

Beginning with the dot com boom, the Internet—a relatively recent phenomenon—began to permeate households worldwide. Back then, websites were little more than plain web pages, and web development was not the sophisticated discipline it is today.

Nowadays, both a front end and a back end are used in web development. Websites consist of a client-side, or the website we view, and a server-side, or the website that the business manages, particularly in industries connected to services, like retail and e-commerce.

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3. Robotic Process Automation

Robots are simply one aspect of robotic process automation. More than anything else, it is about automating procedures. Most procedures required some human involvement before computers. Individuals operated even the manufacturing machinery, and massive production employed thousands of people.

However, as computers have mostly replaced manual labour, manufacturing has also been affected. Automation is increasingly used in all industries, including manufacturing and information technology. The amount of human involvement in these processes is steadily declining, and this pattern is probably here to stay.

Robotic process automation jobs frequently require a substantial level of coding expertise. Typically, we would need to build code to enable automated, human-free completion of computerized or non-computerized procedures.

4. Blockchain

Blockchain is a distributed ledger technology that enables secure, transparent, and tamper-proof record-keeping of transactions. Here are some key aspects of blockchain:

Distributed Ledger: A database that is consensually shared and synchronized across multiple sites, institutions, or geographies.

Blocks: Each block contains a list of transactions. Once a block is completed, it is linked to the previous block, forming a chain of blocks.

Decentralization: Blockchain operates with no central authority controlling the data. Every participant (node) in the network has a copy of the ledger.

How Blockchain Works?

Transaction Initiation: A user initiates a transaction, which is then broadcast to the network.

Validation: Nodes (computers in the network) validate the transaction using consensus mechanisms.

Block Formation: Validated transactions are grouped into a block.

Chain Addition: The new block is added to the existing blockchain, linked to the previous block.

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Update: The updated blockchain is distributed across all nodes in the network.

Types of Blockchain

Public Blockchain: Open to anyone (e.g., Bitcoin, Ethereum).

Private Blockchain: Restricted access, typically within an organization (e.g., Hyperledger Fabric).

Consortium Blockchain: Controlled by a group of organizations (e.g., R3 Corda).

Applications of Blockchain

Cryptocurrencies: The most well-known application (e.g., Bitcoin, Ethereum).

Supply Chain Management: Enhancing transparency and traceability.

Smart Contracts: Self-executing contracts with the terms directly written into code (e.g., Ethereum).

Voting Systems: Secure and transparent voting mechanisms.

Healthcare: Secure and tamper-proof medical records.

Finance: Cross-border payments, fraud prevention, and secure transactions.

Advantages of Blockchain

Transparency: Transactions are visible to all participants.

Security: Cryptographic techniques ensure data integrity and security.

Immutability: Once recorded, transactions cannot be altered or deleted.

Decentralization: Reduces the need for intermediaries and central authorities.

Challenges and Limitations

Scalability: Handling a large number of transactions can be challenging.

Energy Consumption: Consensus mechanisms like PoW require significant computational power.

Regulation: Legal and regulatory frameworks are still evolving.

Interoperability: Different blockchain platforms often lack compatibility.

2.9 E-Governance as a Social Transformational Tool

A recent couple of years have seen a gigantic blast in Information Technology worldwide. The conversion of hardware and broadcast communications has

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opened new vistas of transmission, storing, and recovery of data which was never expected. These are, by and large, progressively utilized for navigation in the corporate world and even in policy implementation. The rising population and its monstrous weight on community conveniences and the financial framework are far from imagination. With this change, e-Governance becomes a need as well as a necessary piece of every country. E-Governance drives in India have customarily been defied with the double difficulties of robotizing government divisions and taking web-based administrations to the average citizens.

E-Governance has moved past government divisions. It is tied in with changing how states work and reexamining individuals' support in the popularity-based process. E-Governance gives a stage to coordinate arrangements and administrations between Government-to-Citizens (G2C), Government-to-Business (G2B), and Government-to- Government (G2G), engaging both the government authority and the citizens.

2.9.1 *ICT: The Revolution*

Building trust among state-run administrations and citizens is crucial to excellent administration and Information and Communications Technology (ICT). It is continuously becoming a fundamental instrument for advancing responsibility, comfort and straightforward administration. States around the country are pushing hard to send data and innovation in their activities. From using ICT for races, registration, and mechanizing all the public authority workplaces to computerized storage spaces e-Transportation, e-Health, e-Education, and e-Taxation, the new India has cleared its direction in the domain of e-Governance. The public authority is working with partners to construct India on this progressive dynamism to extend, augment, and scale up its computerized economy before long, making enormous economic worth and engaging many individuals across varying backgrounds.

Various plans presented by the public authority like Jan Dhan Yojana to give financial incorporation to unbanked individuals have empowered banking, benefits (PMSBY and PMJJBY), and protection (Atal Pension Yojana) administrations to ordinary residents, accordingly, carefully engaging the residents.

2.9.2 *E-Governance in Various Fields*

The framework brings together administration of things, for example, ongoing security and traffic camera film, ambulances' GPS data, temperature,

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humidity level, water levels, smart foundation, and horticulture sensors, and air contamination information in every territory around the state, and afterward imagines the information, which is then utilized in risk scanning. For instance, when a typhoon hits, the water levels of a stream can be evaluated, and prompt directions to clear can be given to those in danger utilizing the prediction ability.

Further, as the set of experiences develops, it offers input for the following time when the examination is directed. Catastrophe reaction precision has improved decisively and routinely depended exclusively upon human experience. The framework can likewise be utilized to increment farming efficiency by introducing and halfway overseeing water level sensors in water system trenches to handle the dry season or flood harm and to forestall harm to agricultural fields and crops. Moreover, soil, climate, and water system conditions can be applied to the calculation, making it conceivable to decide the ideal yield for each plot of land and increment the reap.

2.9.3 *Financial Tool*

With private and public-area activity advancing computerized use, financial innovation advancement has developed quickly. India's widespread banks have likewise determined massive advanced development across economic administrations. Their controller, the Reserve Bank of India, illustrates potential strides for the reception of blockchain innovations in the financial area.

To screen the dangers and security episodes overwhelmingly, the organization incorporated Identity Access Management (IDAM) and SIEM (Security Incident and Event Management Solution) into the digital structure. Thus, it contributes carefully to safeguarding the primary financial data in the developing computerized network situation, guaranteeing a large number of residents in distant areas across India, admittance to very protected and dependable computerized financial offices, and giving a powerful channel to constant financial exchanges.

With the initialization of the government's E-Governance methodology, it has been in excellent sync with the public authority's drives to remain open to different potential outcomes and a large-scale point of view. The result is another degree of e-Governance, centered on expanding financial development and working on the existence of the residents.

Hence, we can bring up that e-administration is a vital component of Good Governance for agricultural countries like India to decrease corruption and

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give compelling and productive or perhaps quality administrations to the residents of theirs. Adjustments to government processes, for example, by regular decentralization to upgrade adequacy and productivity and save costs. E-governance is, as of now, not a trial in regulatory change but a super durable piece of the overseeing system.

E-governance permits continuous co-operation in the majority rule and legislative cycles. It ensures much better arrangement results, better quality administration, and higher commitment to residents. These might be internet providers and data that improve popularity based on support, straightforwardness, responsibility, quality and speed of administration.

2.10 Summary

Information Technology assumes an undeniably significant part in citizens' work and individual existences. PCs, communication, computerized data and programming — the constituents of the data age — are all over the place. However, along with this, there is a need to understand the IT sector's working and growth. Information technology (IT) has great potential as a means of accelerating economic growth, increasing productivity in all sectors of the economy, and effective governance. The application of IT is beneficial and profitable to organizations in the respective E-commerce and E-governance fields. The latest innovations have helped the nation build a robust infrastructure and economy. Thus, creating more opportunities for the youth for the betterment of the country on the digital path.

2.11 Answers to In-Text Questions

1. 46th
2. (*c*) All are true
3. (*a*) Information Technology Enabled Services
4. (*b*) Internet
5. Virtual Reality
6. (*b*) Electronic Commerce
7. (*b*) B2C
8. B2C
9. (*d*) All of the above

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10. (*d*) G2E G2G G2P G2R
11. 2012
12. (*d*) Transforming e-Governance for Transforming Governance

2.12 Self-Assessment Questions

1. State the applications of information technology.
2. What is Virtual reality? Outline the benefits.
3. Describe the benefit of E-commerce to society.
4. Discuss in detail the types of issues to be considered in E-commerce.
5. Explain the B2B business model with the help of suitable examples.
6. Explain the four models of e-governance.
7. Describe smart governance in the context of e-governance.
8. Discuss in detail the types of information technology we use as a student use on a daily basis. What would have been different if this technology was not present in our life?

2.13 References

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LESSON

3

Modes of Data Processing

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STRUCTURE

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3.1 Learning Objectives

- Data File Organizations.
- Relevance of Database.
- Master and Transaction Files.
- Use of Data Files in Programming.
- Input-Process-Output Analysis.
- Management of Data Processing Systems in Organizations.

3.2 Introduction

'Data' has been a buzzword for a very long. Every type of information that we access is a class of data. Data has always been in close association with electronic devices. Accordingly, there is a need to store and code this data as a concept in devices in an optimized form for better usage of this relevant information. At the same time, when we are talking about storing this data, it is vital to learn about how this data storage is used in computing environments and problem-solving. Seamlessly managing data has resulted in modern-day fields like Data Science, Machine learning, and development, with a joint base concept of 'Data.'

3.3 Computer System Software

Let us break down the heading into two parts, *i.e.*, System software and Application software.

System software is a set of programs, data or instructions to perform a well-defined function. A program is a set of instructions written to solve a particular problem.

When these programs are designed to perform functions on a computer system, they are categorized as Computer System Software. System software is a collection of programs defined to operate, control and optimize the processing potential of the computer system.

System software manages the computing and works closely with the hardware. These are generally written in low-level languages that are easy for the hardware to understand.

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Example: Operating Systems - A very prominent system software used in every type of computer. Windows, Android, Linux and macOS are some popular system software that everybody comes across whenever they use some computing device.

The OS is subject to handling computer software and hardware resources. It can be said that the OS acts as a platform between the hardware and the application software that needs to use computer resources.

All these functions correspond to control of the computer system and hardware environment.

To understand the features that system software should hold, let us consider OS as our basis:

1. High Speed
2. Secure
3. Written in Low-level language
4. Close to the system hardware
5. Versatile in handling the processes

After evaluating all these points, it can be said that a system software maintains primary system resources and processes. It must meet specific hardware needs and interactions. It also acts as an abstraction as it works in the background, and users usually do not access it directly. It is essential for the system to have the software that administers it to run the application programs in a computing environment.

Computer programs known as "application software" carry out particular tasks. Application software can carry out a variety of tasks, including personal, professional and academic ones. Application software is frequently referred to as productivity software or end-user software. Each piece of software is designed to help users with specific productivity, efficiency or communication process. In contrast to System software, application software is focused on its functionality and completes the goal for which it was created. On our smartphones, the vast majority of the apps we use are examples of application software.

Example: Microsoft products such as Office, PowerPoint, etc., music application software, etc.

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IN-TEXT QUESTIONS

1. The software which performs a specific task is known as_____.
2. Word processing software is an example of application software. (True/False)

3.4 Software Development Life Cycle (SDLC)

Software development is expanding, and so is the need to deliver high-quality software faster. This has put software development teams under constant strain to produce high-quality software that meets customer expectations, finishes within time and is feasible economically and technically.

3.4.1 *What is SDLC?*

It is essential to understand that when we work to build a product or software, it is essential to go through a series of familiar stages—a road map or flow that helps us create a timely and generate high-quality result. This flow we follow is called the "Software Development Life Cycle."

Accordingly, Software organizations follow a methodology that boosts the overall development process with an intent to describe a software's communication, development, testing, deployment and maintenance.

3.4.2 *Why use SDLC?*

- It supports effective planning prior to the actual development to avoid software crises in the future. This is due to the fact that they adhere to a well-organized approach that enables them to test the software before it is released.
- It helps in regulating costs required for the development. Proper reasoning and studies can predict the cost risks allowing stakeholders to look after costly mistakes.
- It provides methods to assess the effectiveness of the software as each iteration produces a software increment that provides investors

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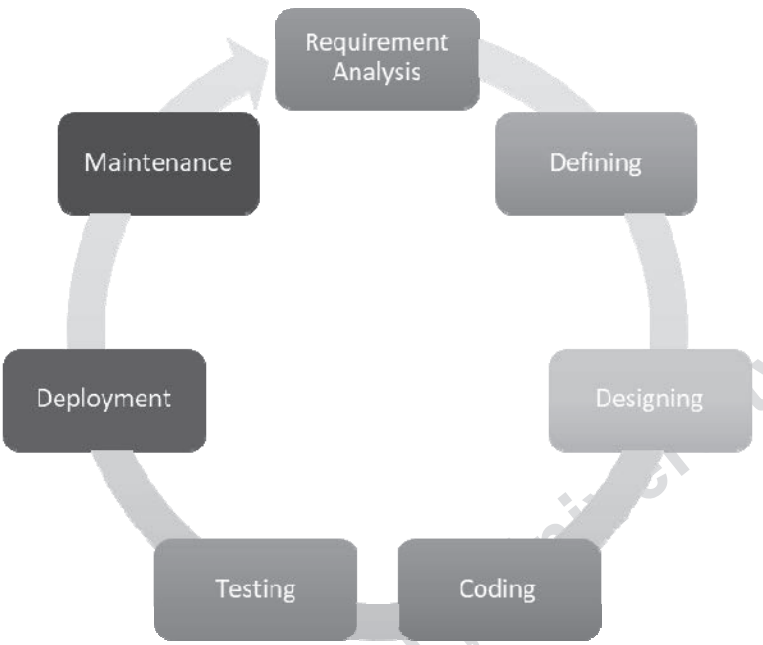
with a sub-class of overall software features and functionality to keep track of time and quality.

3.4.3 *Stages of SDLC*



Stage 1: Requirement Analysis

Requirement Analysis is the most crucial and necessary stage in SDLC. All the project stakeholders communicate quality assurance requirements that cater to the users' needs. The phase also analyzes the risks and costs that may occur during the life cycle.

The project managers and analysts set up meetings with the other stakeholders to discuss the scope and intended audience and perform a rough feasibility analysis followed by probing the customer, the users and others what the requirements for the system or product are, what is to be achieved, how the system or product fits into business proving a core understanding of what is to be built.

In case of any ambiguity, elaboration, negotiation, specification and validation is performed by executing follow-up meetings.

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Stage 2: Defining Requirements

All the conclusions from the requirement analysis are then drawn into the SRS (Software Requirement Specification) document, which is thoroughly followed and reviewed by the stakeholders. This further defines all types of requirements, *i.e.*, functional, non-functional, hardware, etc. and gets them authorized by the stakeholders.

The SRS document defines the whole project and serves as a basis for ensuring all the teams are synced, and the process model is followed.

Stage 3: Designing

Now that all the requirements are defined, the designing of the product starts by understanding the software project's requirements.

The project is modulated and designed to provide the developers with a line on which they have to build the project. This provides a blueprint to the developers in the form of Data Flow Diagrams and UML diagrams such as use cases, state diagrams, class diagrams etc.

Stage 4: Development

The development really starts to take off at this point. The blueprint provided by the design phase is trailed while writing the code. Various IDEs, compilers, debuggers and development tools and languages are used at this stage to implement the project as per the requirements and constraints.

All this gives a working product as an output, but there is still a lot to do with it in order to enhance its quality and effectiveness.

Stage 5: Testing

After all the code is generated, it is tested or validated against the requirements to ensure that the code is developed per the requirements and constraints.

The testing strategies are as follows:

1. Black Box Testing
2. White Box Testing

All this is carried out by unit testing, integration testing, system testing, and acceptance testing.

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Stage 6: Deployment

The product is created, tested, and ready to be presented to the user at this stage. Hence, it needs to be hosted for the users to use it. All the authorizations and reviews are performed with all the stakeholders and based on the assessment; the product version is released.

Once the deployment is done, feedback/suggestions may be given by the users or stakeholders to improve the quality of the product. All these suggestions are taken care of in the next phase.

Stage 7: Maintenance

The issues or suggestions collected once the deployment is done solved at this stage. The real-time issues are solved, thus, maintaining the working and the quality of the product throughout its life.

IN-TEXT QUESTIONS

3. Find the incorrect phase of SDLC (Software Development Life Cycle):

(*a*) Requirement Gathering

(*b*) System Analysis

(*c*) Software Design

(*d*) All of the above

4. The first stage in SDLC framework is _____.

5. SDLC stands for _____.

6. Find the incorrect testing technique:

(*a*) Collaboration testing

(*b*) Integration testing

(*c*) System testing

(*d*) Unit testing

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3.5 Software Development Process

3.5.1 *What is SDP?*

The software development process divides the software development into small, sequential steps to reinforce the product, project and style altogether. The term "Software Development Process" refers to the iterative, logical procedure used to create software programs that meet the needs of any corporate or personal goal.

3.5.2 *Types of Models*

In the software development phase, various software development life cycle models are specified and designed. "Software Development Process Models" is another name for these models. To ensure success in the software development step, each process model adheres to a set of steps that are specific to its type.

3.5.2.1 *Waterfall Model*

The software development process divides the software development into tiny, sequential steps to reinforce the product, project and style altogether. The software development process is an iterative, logical method for creating computer programs that meet the needs of any business or personal goal.

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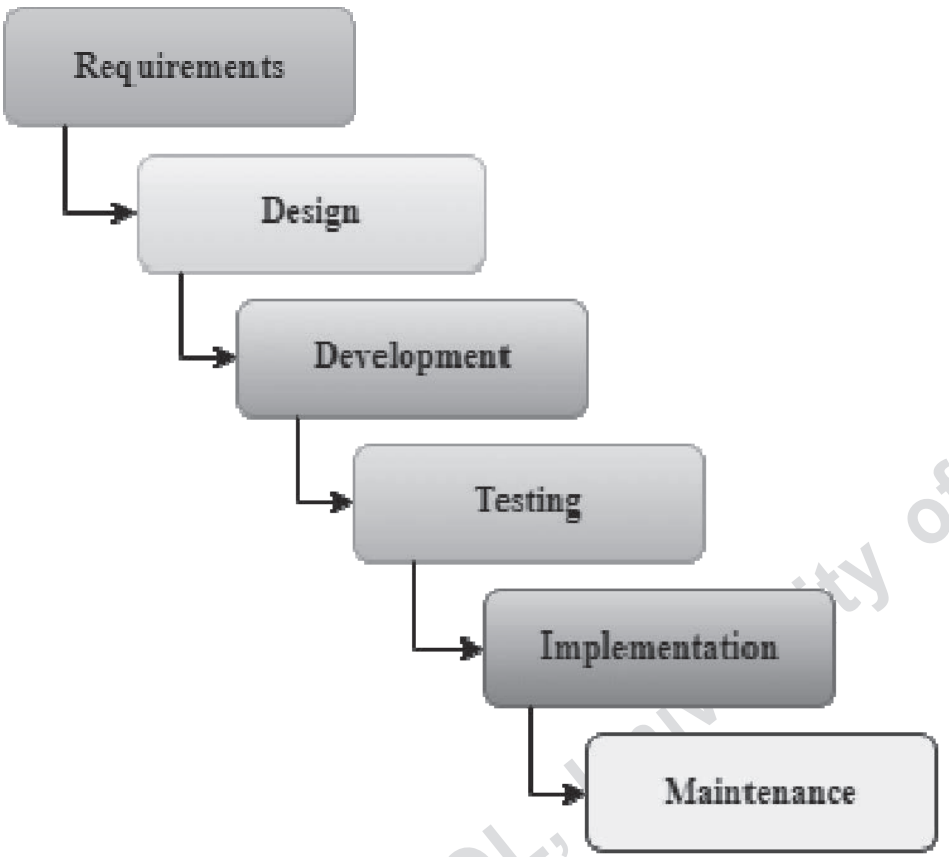

Waterfall Schematic Diagram

Advantages of Waterfall Model:

- This model is simple and easy to use and understand.
- It is easy to manage due to the rigidness of the model – each phase has specific deliverables and a review process.
- Clearly defined stages.
- Well-understood milestones.

3.5.2.2 *Iterative Model*

Here Iterative development software changes after every iteration to evolve and grow. Since each iteration is based on the previous one, the software design remains consistent. As software is delivered in fragments, there is no need for a comprehensive specification from the project's initiation, and minor changes to requirements are possible during the development

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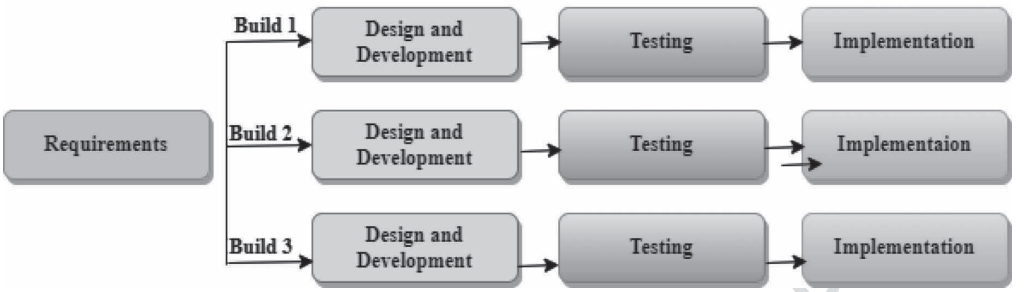
process. Major requirements, especially those for system architecture in the event of incremental development since further integrating the created software components can become a problem, cannot be changed after they are established.



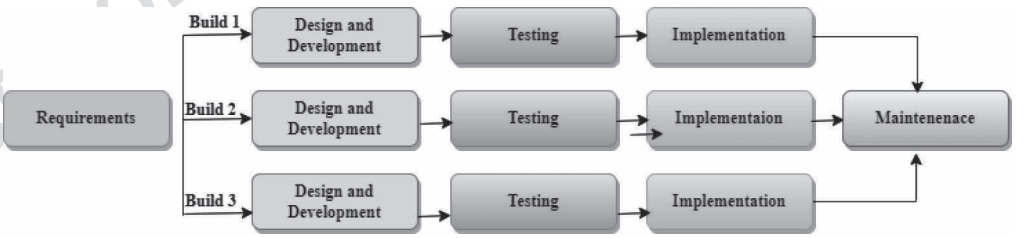
Iterative Schematic Diagram

Advantages of Iterative Model:

- Less expensive to alter or repair the scope and requirements.
- Produces working software swiftly during the software life cycle.

3.5.2.3 *Incremental Model*

The incremental model is a process of software development where requirements are fragmented into multiple standalone modules of the software development cycle. Every version of the system adds functionality to the preceding release as each iteration progresses through the processes of requirements, design, coding, and testing. This process continues until all intended functionality has been realized.



Incremental Model Schematic Diagram

Advantages of Incremental Model:

- It is easier to debug and test during a small size iteration.
- Here users can respond to each build.
- Decreases initial delivery cost.

AGILE MODEL

The agile Software Development Life Cycle (SDLC) model combines iterative and incremental process models with a focus on process adaptability and customer satisfaction through quick delivery of functional software. The product is divided into smaller incremental builds using agile methods. Iterations of these builds are supplied. Usually, an iteration lasts between one and three weeks.

Cross-functional teams work simultaneously on several different topics during each iteration, including:

- **Planning**
- **Requirements Analysis**
- **Design**
- **Coding**
- **Unit Testing**
- **Acceptance Testing**

3.5.2.4 *Evolutionary Model*

Within the evolutionary model, all the work is completed during the development phase. During this model, all work is divided into small chunks or modules. For instance, the Waterfall Model, during which all the users can access the product at the end of each cycle. This model may be a combination of incremental and Iterative models. The drawback of all models is that it takes a very long time from the start of the project to offer a solution. The evolutionary model finds a different solution to this issue.

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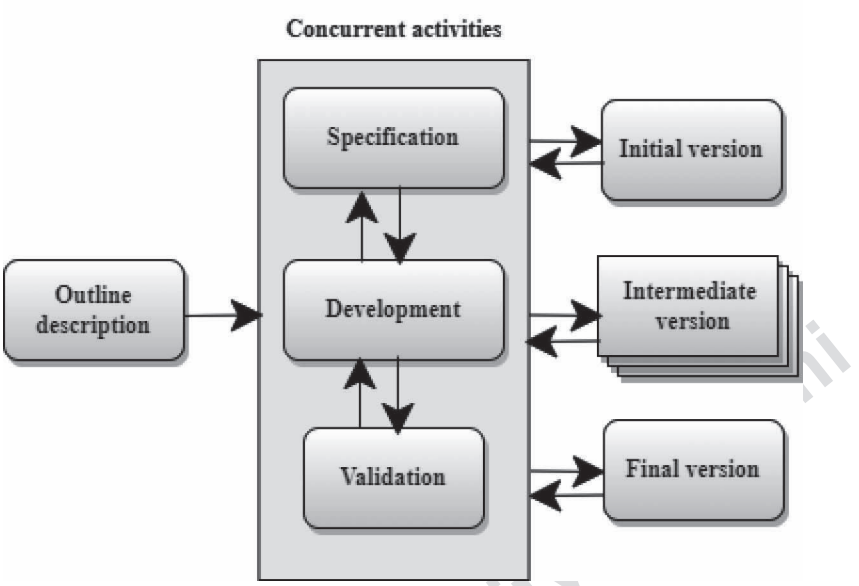

Evolutionary Model Schematic Diagram

Advantages of Evolutionary Model:

- The process of determining how likely a risk will occur in a project is called risk analysis. It examines the ambiguity of prospective risks and how, if they materialised, they might affect the project's schedule, quality, and costs. It is easier to analyse risk in this model.
- It supports changing environment.
- Better suited for large mission-critical projects.
- The software is produced swiftly during the life cycle, facilitating customer evaluation and feedback.

3.5.2.5 *Spiral Model*

The Spiral model provides insight into complete risk analysis. Therefore, if we want to benefit entirely from the approach, we must work with individuals with solid risk analysis experience. A particular Spiral iteration lasts about six months and starts with four essential activities - thorough planning, risk analysis, prototype creation and evaluation of the previously delivered part. Spiral cycles that are repeated significantly lengthen project timelines.

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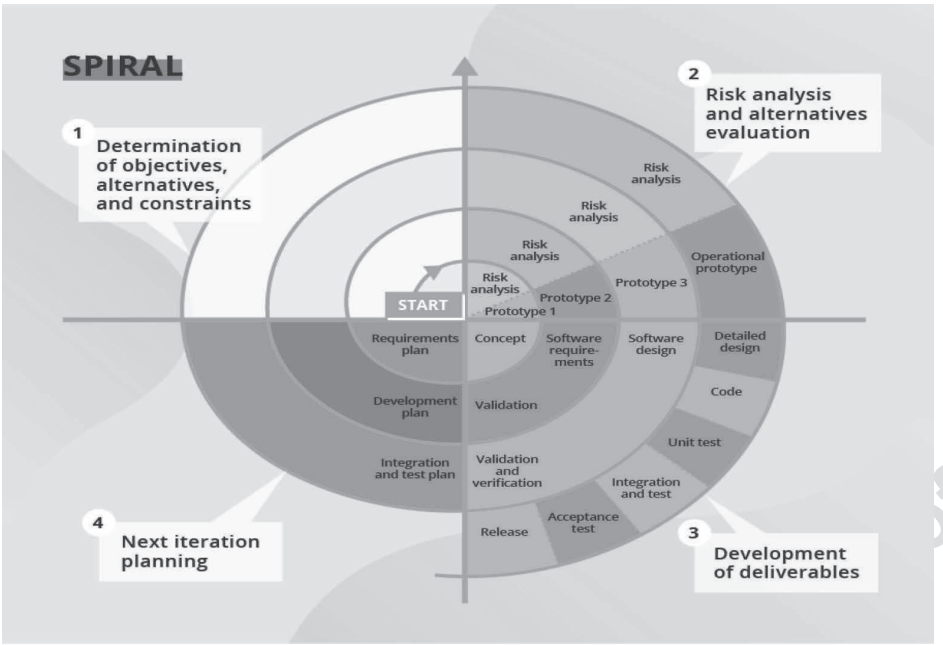


Spiral Model Schematic Diagram

Advantages of Spiral Model:

- With a more significant amount of risk analysis; hence, Prevention of Risk is enhanced.
- Suitable for large and mission-critical projects.
- Strong approval and documentation control.
- Additional functionality can be added later on.

IN-TEXT QUESTIONS

7. What is the Spiral Model's biggest flaw?

(*a*) Higher amount of risk analysis

(*b*) Additional functionalities are added later on

(*c*) Strong approval and documentation control

(*d*) Does not work well for smaller projects

Notes

8. The incremental model is the combination of which models?

(*a*) Build & FIX Model & waterfall model

(*b*) Linear model & waterfall model

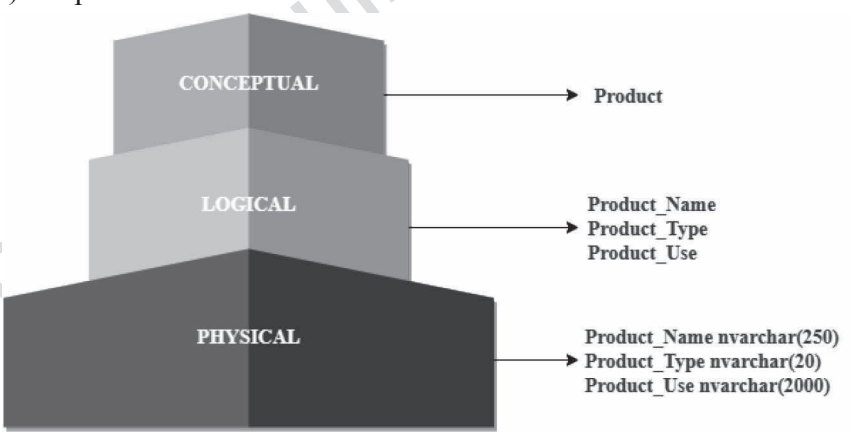
(*c*) Linear Model & Prototyping Model

(*d*) Both (*a*) & (*b*)

3.6 Data Design

Consider a situation where we need to locate a particular data file among many data files. Evidently, it is a rigorous process since we have to check every data file. However, what if we design a structure to arrange the data in a specific pattern? It will not only save us time but will lead to an efficient mechanism. That is what data designing is about.

To sum up, data designing demonstrates the types of data stored in the system and how we can group the related data together in a well-organized manner to create a robust design. It helps to design the databases on a physical and logical level. Producing an Entity Relationship Diagram (ERD) helps to visualize the mechanism.



3.6.1 *Levels in Data Design*

This architecture has three levels: the physical level, logical level and conceptual level.

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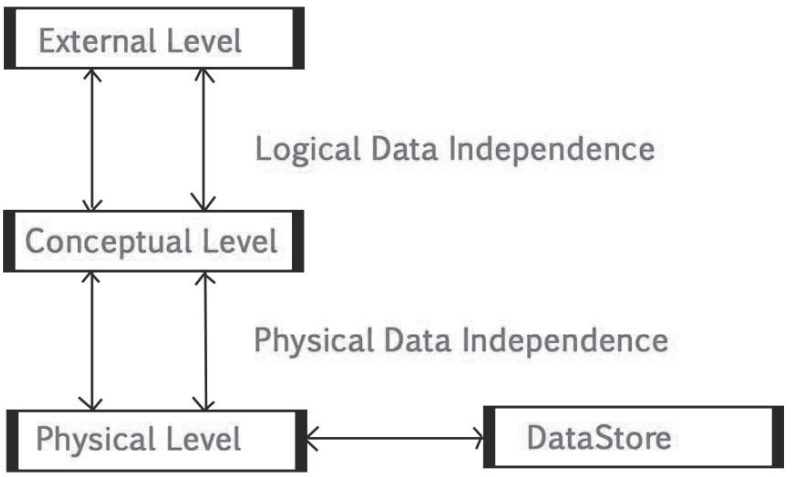

◆ **Conceptual Level:** A conceptual model should be focused on things related to the business and its requirements. This explains what the system contains. The purpose is to define and organize business rules and concepts and therefore is created by business stakeholders. Entities and relationships modeled in such ERD are evidently around the business's needs. It is the simplest among all.

Data Abstraction - Schemas

Physical Schema

- Database design at physical level
- ***How*** the data are actually stored?
- File organizations
- Indexes

Conceptual (logical) Schema

- Database design at logical level
- ***What data*** are stored in the database, and ***what relationships*** exist among those data
- E.g. - Faculty (id: string, fname: string, sal:real)

External (view) Schema

- Database design at view level
- Highest level of data abstraction
- Customized level of data access for different users.

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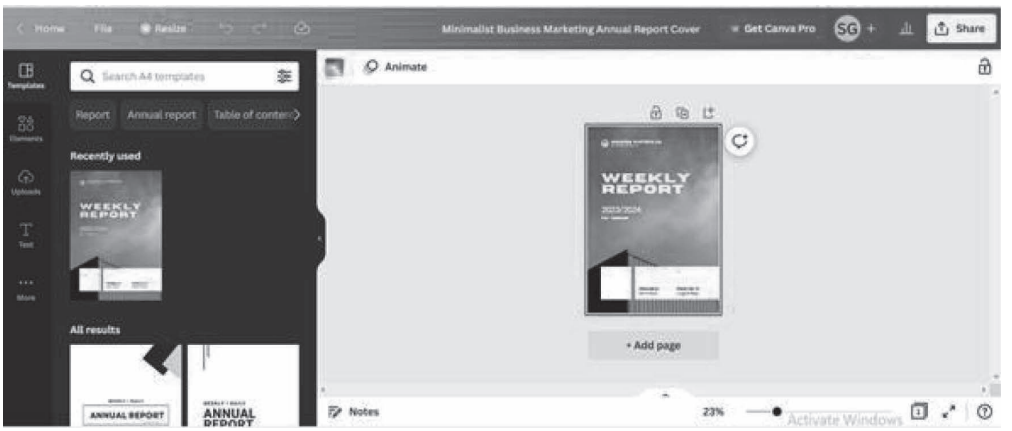
◆ **Logical Level:** The logical model defines how the system should be implemented. It should be focused on the design of data about those things without reference to a particular physical implementation. It is created by data architects, and the purpose is to develop data structures. It typically refers to implementation details like relational, Hierarchical, Key-Value, Object-Oriented and Graph.

◆ **Physical Level:** A physical model describes how data is stored, like data formats, indexes, data partition, distribution, etc. It represents the actual design blueprint of a relational database and how data should be structured. The goal is actually to implement the database. It explains the relation in a specific DBMS, so it is vital to consider the convention and restrictions of the DBMS we use when designing a physical ERD. This means that proper use of data type is needed for entity columns, and the occurrence of reserved words should be inhibited in naming entities and columns. It is created by DBA and developers, so they may also add primary keys, foreign keys and constraints to the design.

3.7 Report Design

The report is the document that explains the process, outcome and all the work we have done to accomplish the final design.

Now, we might have gathered all the relevant information, but there is no certainty that it will be engaging. Some might find it verbose; we have to design the report in such a way that it highlights and reflects what we want to convey to the users/readers. In order to accomplish that, report designing comes into play. Today, we have many tools to design our report. We can get ready-made templates, and even one can add their specific type of requirements and designs.



One has to also look into report styling. It includes some features like:

- Report layouts to make it presentable.
- Charts, maps and other data-bound items to make it engaging.
- Various styling capabilities like conditional formatting etc.

Thus, the reports can be styled and exported in any format.

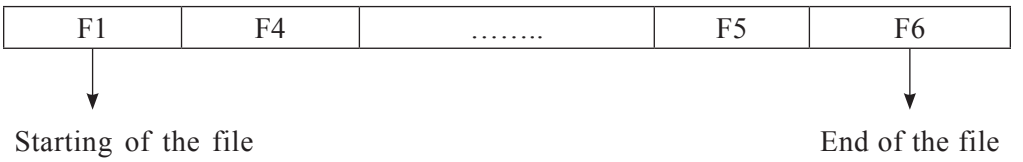
3.8 Organisation of Data Files

A file is a named structure that holds related data and can be stored on various secondary storage devices. Since the data can be organized in different ways, there are various organization types available for files.

Some File Organizations:

1. Sequential File Organization
2. Random File Organization
3. Indexed-sequential File Organization
4. Serial File Organization

3.8.1 *Sequential File Organization*



This is the simplest way of storing data where records are kept in a particular sequential sorted order. Sorted records make it easy for the operator to search a record in the file by applying algorithms like binary

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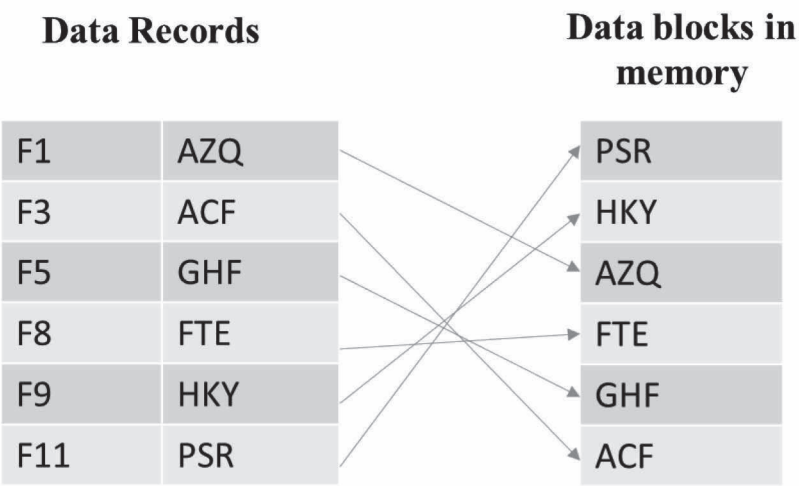
search. Nevertheless, there is a catch; all records cannot be of the same size; therefore, it is difficult to inculcate this organizational approach.

3.8.2 *Random File Organization*

The organization approach allows us to store the records randomly but provides direct access. For direct access records, keys are used to find the records associated with them. Example: Magnetic and optical disks follow this technique of organizing files. This has an advantage over the sequential organization as the records can be of different sizes.

3.8.3 *Indexed-Sequential File Organization*



An index is used to help the computer find specific records on the storage media, almost identical to the sequential method. For instance, records are sequentially stored on the tracks of a magnetic drum. Each record is given a unique index, which can be used to access it directly.

3.8.4 *Serial File Organization*

The term "heap file" also refers to serial file organization. This procedure adds records to the data blocks at the end of the file. The sorting of data is not necessary. This strategy is appropriate when a large volume of data must be loaded into an organization.

Data access takes longer than using a sorted file approach.

IN-TEXT QUESTIONS

9. The data file contains_____.

10. _____ is the process of arranging your files into blocks and placing those blocks on a storage media.

11. What does sequential file organization entail?

(*a*) Any record can be placed wherever there is a space for the record

(*b*) Records are stored in sequential order according to a search key

(*c*) A hash function is computed on some attribute, and that decides the block

(*d*) None of the mentioned

3.9 Master and Transactional Files

Various file types are used to store data needed for processing, reference, or backup. The most prevalent categories of processing files are Master files, Transaction files, Reference files, Backup files, Report files and Sort files.

3.9.1 *Master File*

As the name suggests, ‘ master’ serves as an authoritative data source. It is the main file pertaining to relatively permanent records about specific items or entries. Output and input (parameter files) files are specified in the master file. Such files include information that is continuously updated by recent transactions. It can be further sub-divided into static and dynamic master files. Examples include customer ledgers like a customer file will contain details of a customer such as a customer ID, name, and contact address.

3.9.2 *Transaction File*

A transaction file is used to hold data during transaction processing. The data relating to business events are recorded. The file is later used to update the master file and audit trails. For example, daily sales are recorded in a busy supermarket on a transaction file and later used to

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update the stock file. The management also uses the file to check on daily or periodic transactions.

Assume we have both a master data set and a transaction data set with the variables ID, DEPT and SALARY. The data sets' contents are as follows:

DATASET MASTER

ID	DEPT	SALARY
1	MARKETING	12,000
2	SALES	9,000
3	RECORDS	14,000
4		11,000

DATASET TRANS

ID	DEPT	SALARY
2		15,000
4	PEOPLE	

To update the records, apply the transaction data set to the master data set. The new master file obtained is:

DATASET NEWMASTER

ID	DEPT	SALARY
1	MARKETING	12,000
2	SALES	15,000
3	RECORDS	14,000
4	PEOPLE	11,000

Because these IDs 1 and 3 are absent from the TRANS data set, observations 1 and 3 in the original MASTER data set are unaffected. In observation 2, the MASTER data set's ($ 9,000) corresponding value for SALARY was replaced by the TRANS data set's value of $ 15,000.

However, the DEPT value in observation 2 of the TRANS data set did not take the place of the DEPT value in the MASTER data set since it was absent. The new observation will be included in the new master data set if the transaction data set contains a value of the BY variable (ID) that is absent from the master data set.

3.9.3 *Purpose of Master and Transaction Files*

The precise details of customers, suppliers and employees, as well as records of recurrent occurrences relevant to each, are often found in company databases, which can hold exceptionally enormous volumes of information. These databases frequently consist of separate master and transaction files. The master file includes information that is unique to an individual or corporation, such as names, company contacts, addresses, email lists and particular products or services. The transaction file includes facts about employee leave, disciplinary actions, career advancement reports, sales or buy transactions, calendar events or employee details.

These blocks of transaction data include a key entry which is a piece of information common to both master and transaction files. This may be an account number, a contact name, an employee identification number, or financial details such as purchase orders or invoice numbers. The key entry is a unique identifier that the database uses to tie the transaction entries to their corresponding master file records. Any query or search for a particular master file transaction will then isolate either the entire group of entries for that record or any one specific entry, depending on how specific the key is.

Basically, transaction files are used to update master files; they are often linked together.

Maintaining separate master and transaction file records allows the master file to be kept at a manageable size and dedicated to entity-specific entries only. In applications in which users store transaction records off-site or on archive servers, separating them from the master file also makes archiving a lot easier. Keeping a dedicated transaction file also makes for easy and effective auditing. This file may also serve as a diagnostic or planning aid with many databases featuring extensive reporting functions based on its contents. This type of split file arrangement is often known as a referential file system because the master file "refers" to the transaction file for specific event details.

3.10 Relevance of Database

Databases and database systems have become essential components of everyday life in modern society. Within the course of a day, most folks encounter several activities that involve some interaction with a database,

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when we visit the bank to make deposits or withdrawals, when we book a hotel or flight, when we use a computerized library catalog to look up a bibliographic item, or when we order a magazine subscription from a publisher, the likelihood that someone will access a database as part of our activities increases.

The above interactions are samples of what we may call traditional database applications, where most of the knowledge that is stored and accessed is either textual or numeric. Within the past few years, advances in technology are leading to exciting new applications of database systems. Multimedia-based databases can now store pictures, video clips and sound content. Geographic Information Systems (GIS) based databases can store and analyze maps, weather data, and satellite images.

Data warehouses and online analytical processing (OLAP) systems are utilized in many companies to extract and analyze useful information from vast databases for decision- making. Real-time and active database technology is employed in controlling industrial and manufacturing processes. Database search techniques are being applied to the planet wide web to improve the search for information needed by users browsing the Internet. Some common examples are given below:

(*i*) Reservation System

We all know how to book tickets in places like- movie theatres, train tickets, airline tickets, etc. While booking, we must supply our details so that a particular seat is reserved with us. So here also, these reservation systems are using the database and management system for achieving this. The info stores are like – customer name, train number, price, date, etc. Moreover, these details are required to spot the correct person during the trip.

(*ii*) Telephone Companies

Without databases and management systems, telephone businesses cannot simply survive. We can also ask how these mobile operator businesses maintain track of the daily data limit, as well as the calls we make, given that every mobile phone includes a sim card for calling and internet access. For keeping our data, they are utilizing databases and database management systems. They save the data and produce cell bills based on our usage. DBMSs are used by more than just Internet service providers, mobile carriers, etc.

In conclusion, databases and database technology have a significant impact on how computers are being used more and more. In the majority of

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applications where computers are employed, it is reasonable to assume that databases play a crucial role.

IN-TEXT QUESTIONS

12. OLAP stands for_____.

13. Which of the following helps people keep track of things?

(*a*) Database

(*b*) Table

(*c*) Instance

(*d*) Relationship

3.11 Flow Chart

Diagrams and charts are always descriptive and captivating when it comes to solving a problem. One such interesting diagrammatic representation technique is flowcharting. The technique can be used to visualize a direction in which a process heads to produce a solution to the problem.

When it comes to programming, flowcharting is frequently used to depict how an algorithm operates. Along with providing direction, the technique also gives us insights into how the process is broken down into stages to land at the final solution.

One attractive aspect of flowcharting is that each step is independent of implementation at any stage and is only concerned about the input and output of a particular stage rather than the actual processing to be done. Additionally, this approach of flowcharting a problem categorizes types of tasks such as data, decision, process, etc.

To diagrammatically represent these categories, there are symbols that signify each category:

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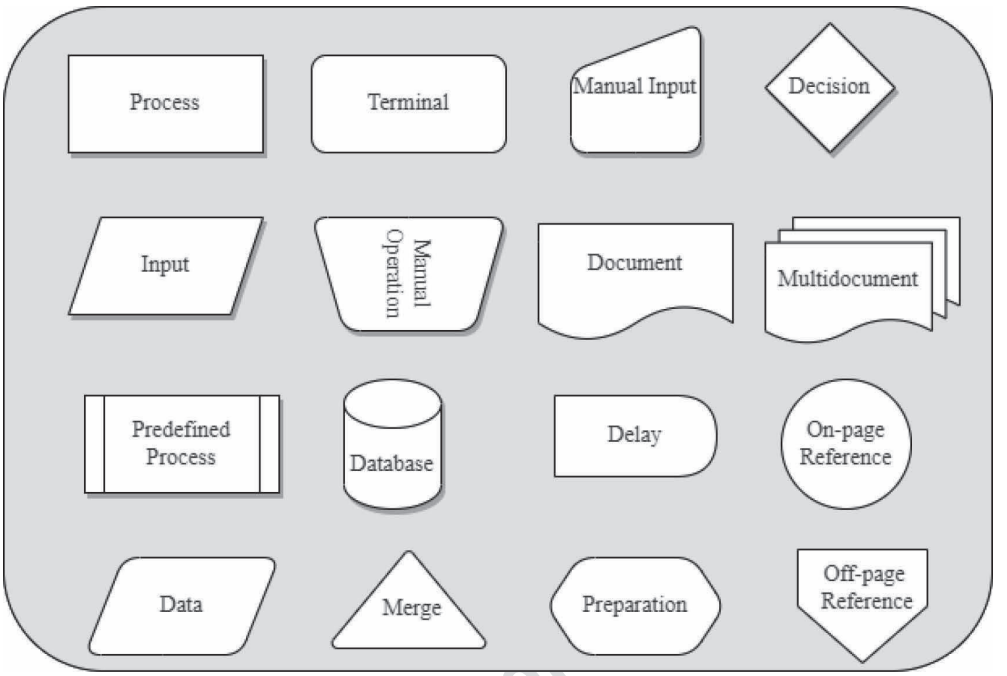

Now that we are aware of how flowcharting acts as a utility, we can dive deep into how the follow-up that it suggests.

(*i*) Establish the task

Starting with the task that has to be completed, the first stage in using a problem-solving strategy is to establish and define it. Once the problem is defined, a possible solution can be thought of, followed by answering the questions such as "what is the step to be done prior to this?" or "what should be done next?" these types of questions give out the chronological structure of the way to be followed to pull off the result.

(*ii*) Depict the Chart

Once all the questions are answered about heading in a problem-solving line, the illustration is done. Wherein the tasks are drawn as per their categories using the symbols mentioned above. The tasks are sequential in nature, as in, what happens next? All these tasks are connected with arrows according to the flow of the solution proposed.

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(*iii*) Check the Process

This step is all about re-checking what has been done in the previous two stages. Double checking the flow chart from start to end cuts the possibility of leaving out some tasks in the flow or can identify a wrong flow when it comes to decision-making or the sequence that it is expected to follow.

(*iv*) Optimize the Chart

Solution approaches to some problems might get complex very often. Therefore, optimizing a chart can simplify the view and can provide a better and clear-cut picture. Redundant and unnecessary tasks can be removed, including performance-enhancing optimizations, until we get an efficient diagrammatic representation of the solution.

Performing all these steps can get overwhelming when the problems are complex and demanding when it comes to the number of tasks to be performed. There are several tools, such as draw.io, creately, and many others, that make this simple and offer free services to execute such flowcharting.

Given below is an example that shows how flowchart can be used in showing a simple summation process.

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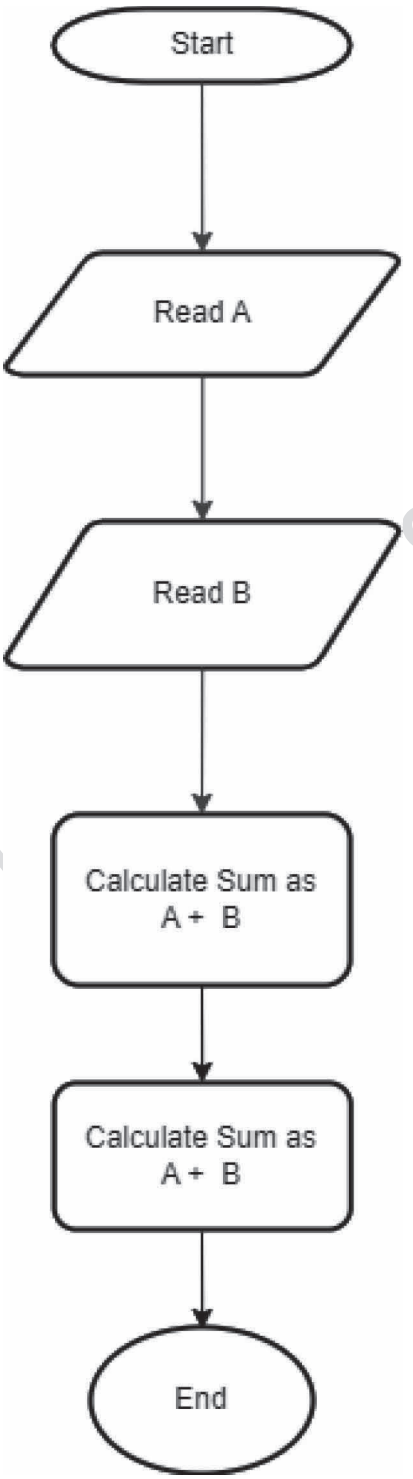

IN-TEXT QUESTIONS

14. A box that can be used to symbolize two different situations.

(*a*) Rectangle

(*b*) Diamond

(*c*) Circle

(*d*) Parallelogram

15. Drawing a flowchart for an algorithm is referred to as.....

3.12 Input-Process-Output Analysis

A computer is an electronic device that accepts data, processes data, generates output and stores data. Input-Process-Output (IPO) is another name for the idea of creating output information from input data.

The input-process-output concept of the computer can be interpreted as follows—

- **Input:** The computer accepts data as input from the user with the help of an input device. The input data can be anything, including characters, words, text, sound, images, etc.
- **Process:** The computer processes the input data. It performs some operations on the data by using the instructions or program given by the user of the data. The action could be arithmetic or logical processing, editing, modifying a document, etc. During processing, the data, instructions, and output are stored for some time in the computer's main memory.
- **Output:** The outcome of data processing is known as the output. Text, sound, images and other types of output are all possible. The output from the computer can be played, sent to a printer for printing, displayed on a monitor, etc.
- **Storage:** Secondary storage devices like discs or tapes permanently retain the input data, instructions and output. Anytime later, as needed, the stored data may be retrieved.

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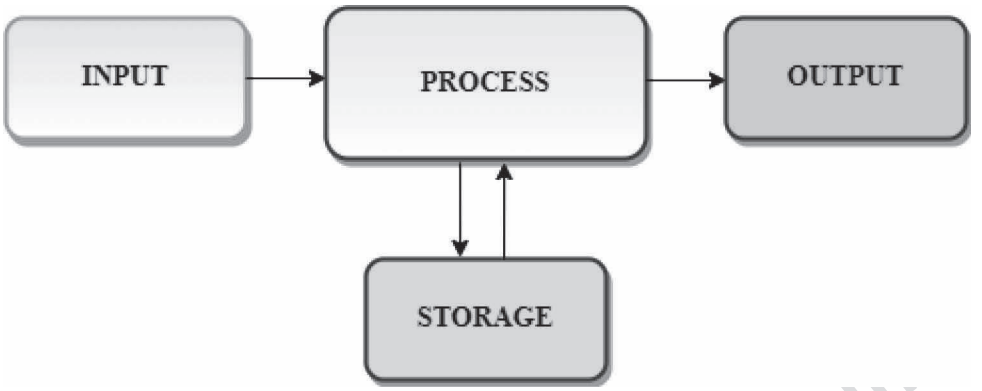

The Input-Process-Output Concept

3.13 Report Generation

Reports must be accurate, timely, and pertinent. To accomplish these three aims, report generation is required and the effectiveness of the generation program directly affects our ability to accomplish the three targets. Then, either Excel or Python makes it challenging to generate reports. This section will walk us through everything we need to know about report generation, including its definition, features and software list.

3.13.1 *What is Report Generation?*

The practice of employing a program to generate reports, mainly for business users, is known as report generation. We must develop a report definition that specifies the data to be retrieved, where to find it, and how to show it before we can generate a report.

For a very long time, Excel has been used to create reports. However, many individuals have criticized how difficult and painful it is to create reports using Excel, particularly when we need to do so frequently for regular reports like daily, weekly and monthly reports.

3.13.2 *Features of the Report Generator*

Compared to Excel, the report generation software makes the process of creating reports more effortless and more professional, from data entry to data display. There is less need for us to write code, for instance, to

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extract data from databases as we would with a SQL database. With a few clicks, even non-technical individuals may get data.

YoY and MoM calculations are included in the software as well, saving the time it would take to enter them in Excel manually.

Every stage of the report generating process is more user-friendly with the report generator. Let us examine the attributes of the report generator in greater detail. Using Fine Report as an example, we can see how we increased our productivity at work by 100%.

- **Feature 1: Support Extracting Data from Multiple Data Sources**

  Report generators allow users to aggregate and extract data from numerous data sources.

- **Feature 2: Works with Real-Time Work**

  The daily, monthly, quarterly, and annual reports can be generated automatically and sent to the specified email address after the templates and frequency are set up.

- **Feature 3: Support Reusing Templates**

  Users can reuse completed report templates to create new reports. Numerous beautiful built-in templates cover a range of situations and businesses.

- **Feature 4: Support Reports Exporting and Printing**

  Reports can be exported or printed to Excel, PDF, CSV or pictures by users.

- **Feature 5: Support View Reports on the Web or on Mobile Applications**

  Users can access reports on mobile devices at any time and from any location, thanks to the current report generator.

3.13.3 *Report Generation Process with Report Generators*

There are two different report generation processes available when using the report generators. The full-automatic generation is one and the semi-automatic generation is the other.

3.13.3.1 *Full-Automatic Generation*: Based on the template

Consider the most popular financial data, such as MoM and YoY Ranking, as an example. Financial statistics templates have been constructed inside

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report generators like Fine Report, from indicators to formulas, from titles to formats. When using the fully automated generation, all one has to do is log in to their database and drag the appropriate cell.

3.13.3.2 *Semi-Automatic Generation*: Use Professional Functions to Generate Each Module Automatically.

Semi-automatic report generation is more prevalent and better able to cater to the unique needs of customers than full-automatic report generation.

A whole report design process may typically be broken down into the following three steps:

1. Open designers, configure data sources, create new reports and configure private data sources as part of connecting to databases.
2. Create new reports, define data sources, bind data columns, summarise and format reports as part of the report design process.
3. Report previewing, saving and publishing are all included in the phrase "publish and browse reports."

The process of retrieving the data from the database, structuring it, and exporting it as reports is referred to as report production. It offers illuminating insights and reassuring references to decision-makers.

A skilled report generator can be a valuable ally in business at every stage of reporting. It is best to conduct a thorough study on each feature of report generation software before selecting the best option for business. A functionally unrestricted free version of Fine Report is available for personal use.

3.13.4 *Popular Report Generators (Report Generation Software)*

There is a rising need for reporting tools that are entirely written in Java as the B/S structure is used more frequently. There are canvas-like generators and Excel-like generators from the standpoint of the interface. These two interface paradigms are sometimes combined by software.

The top three report generators in the company are as follows:

- Fine Report
- Crystal Report
- SQL Server Reporting System

IN-TEXT QUESTIONS

16. A report generator is utilized to _____.

(*a*) Print files on paper

(*b*) Data entry

(*c*) Update files

(*d*) All the above

17. When a query runs or the report is processed, reports use _____ to retrieve data for a report.

(*a*) Data connections

(*b*) Data source definition

(*c*) Connection string

(*d*) All of the mentioned

3.14 Programming Concepts

Programming is the process of first solving a problem and then writing the code. One needs to figure it out to solve a problem by keeping fundamental programming concepts in mind.

This piece talks about two major programming approaches, *i.e.*, procedural programming and object-oriented programming, as well as other supporting concepts to support these approaches, namely variable declaration, basic syntax, data types and structures, flow control and debugging.

3.14.1 *Procedural Programming*

A programming style that uses a linear or top-down approach. It relies on procedures or subroutines to perform certain functions or tasks. Programs written using this approach comprise a sequential pattern of instructions to be executed to get the desired results.

The procedures can be seen as logic chunks that can be called anywhere in code. The catch here is that these logic chunks are sequential in nature. Therefore, it follows a structured programming method that uses block-based program control flow.

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3.14.2 *Object Oriented Programming*

In contrast to procedural programming, this programming approach revolves around objects and methods rather than sequential procedures.

- Objects are the elementary component of OOP; they can be understood as real-world entities that have behaviour and attributes associated with them. Example: A student is an object that has attributes such as name, class, roll No. age and has the behaviour of reading, writing, speaking, etc.
- Class is a blueprint of an object which declares variables, constant and member functions and then concludes all these as a single data type and its methods.

The four pillars of OOP are:

(*i*) Abstraction: Hiding unnecessary details.

(*ii*) Encapsulation: Binding data and functions together.

(*iii*) Polymorphism: Methods with the same name but different signatures.

(*iv*) Inheritance: Acquire properties of an existing parent class.

Now that we have a brief overview of the abovementioned programming approaches, we need to know about some concepts that support these approaches.

1. Variable Declaration

These are containers for storing data values at a memory location. The declaration is usually made by certain keywords according to the language used.

2. Syntax

To write a code that a computer can understand, one needs to use some programming language; like any other language, programming languages also have words and rules that define them; these rules need to be followed by a programmer to write a code that can be understood by the computer.

3. Data Types and Structures

A data type is the category of the data value that is being handled. For example, data can be of numeric type: 1, 2, etc. It can be of character type: 'a', 'b'...

Some of the fundamental primitive data types are:

- Numeric - Integer and Floating Point
- Character

- String
- Boolean

Data structures, on the other hand, are organized structures having a set of data values on which functions can be applied. These structures are used to optimally store a set of values and perform efficient operations on the data.

- Stack
- Queue
- Tree
- Heap
- Linked List
- Array

4. Flow Control

The flow of a program is a result of decision-making statements that decide what direction the program will go based on the derived scenario.

Three types of control flow:

- **Sequential :** It follows the linear execution of statements, *i.e.*, one after the other.
- **Selection :** A test condition selects what action to perform based on the result of the test as true or false.
- **Iteration :** A statement or a block of code is run repeatedly till the test condition remains true, thus forming a loop.

5. Debugging

Locating errors and rectifying them is a bottom-line activity that makes the code written to produce the desired result. Various tools and techniques are used for locating errors to save time and effort.

IN-TEXT QUESTIONS

18. Which of the following OOPS ideas refer to giving the client access to only the information they need?

(*a*) Encapsulation

(*b*) Abstraction

(*c*) Data hiding

(*d*) Data binding

Notes

19. A computer programming language that states a series of well-structured steps and procedures within its programming is known as_____.

20. _____ data type is used to store the value 200.

3.15 Use of Data Files in Programming

When a program is terminated, complete data is lost but to prevent this; data files are used. Since data files are stored in Random Access Memory (RAM) when the program is running, and it is stored in Read Only Memory (ROM) when the program is terminated. Data files are stored in non-volatile memory after the program is terminated, resulting in the preservation of data. As shown in the image below, a C program writes something in the file, and the data is stored on disk (ROM) in the form of an ASCII Text File or Binary File.

◆ **Handling the Huge Amount of Data:** Whenever a program requires a large size of data, it can be very tedious and time taking to enter that data. However, if we pass that data into a data file, it will become very suitable for the programmer to use that data in the program. It is possible because of the accessibility of the contents of the data file using read commands in programming languages. The only condition is that the data should already be present in a data file, and from that data file, the programmer can easily use fragments of data.

◆ **Data Transmission:** Transferring data from one computer to another is a ubiquitous example of data transmission, but the data produced by a program cannot be transferred. It can only be transmitted by converting the data into a data file and then transferring the data file to another computer. The data transmitted by data file will be unaltered while transferring, *i.e.*, it will not be affected by the future changes made by the program unless the programmer explicitly changes the data.

◆ **App and Web Development:** We all know that App Development uses XML for Designing the app, Whereas Web development uses HTML. Whenever we load a web page or an app screen, a data file is created in the background, storing the data about the design and how that design is implemented.

◆ **Hidden Datafiles:** Sometimes a programmer requires to store some data which should be hidden from the user to prevent the user from corrupting or tampering with the data. This is accomplished by using closed data files format or proprietary format files. Here data files contain metadata (Data about Data) elements according to the preferences of a programmer.

3.16 Management of Data Processing Systems in Organizations

Data is not helpful in its original form to any organization. For organizations to improve their business strategy and gain a competitive edge, data processing plays an important role. Employees worldwide can understand and use data by turning it into a readable representation in graphs, charts, tables and documents.

By data processing, we refer to the carrying out of operations on data, especially by a computer, to retrieve, transform or classify information to generate usable information from raw data. An organization's team of data scientists and data engineers often performs it in a step-by-step manner. The raw data is then collected, sorted, processed, examined and stored in a readable format.

Thus, managing a data processing system involves both the system's hardware and software as well as some stages of data processing:—

- **Data Collection:** The first step of data processing is the collection of the data. Data is pulled from the available sources an organization has of its employees. The data sources available must be trustworthy and well-built.
- **Data Conversion:** Transforming data into a format that can be processed.
- **Data Cleansing:** Often referred to as the pre-processing stage of data processing. It eliminates errors from data before processing. Raw data is cleaned up and structured for data processing.
- **Organizing:** Involves grouping the data into sets or groups, or categories.
- **Data Input:** The organized and cleaned data is then entered into its destination and translated into a language the system can understand.
- **Analysis:** Also known as processing. The data is processed for interpretation by which extracting and producing valuable data from the raw data is possible.

Notes

- **Reporting:** Presenting the information. It is the output of processing data usable to non-data scientists in the form of graphs, videos, images, tables and many more.
- **Data Storage:** The final stage of data processing is storage. After all the data processing stages, the data must be stored so that it cannot be lost, so for future reference, the data is stored.

Management of system resources assigned to the various functions is necessary for managing the many parts of the data processing system. The process of coordinating all the functions to guarantee the system runs smoothly is also included in management. Control is an oversight role of management and ensures that the data processing system performs an anticipated and produces the desired result. Control also ensures that any system problems are identified and fixed.

For a company or organization, the task of data processing is crucial as it helps to understand information quickly. Data processing increases productivity and profits, better decisions and more accurate and reliable data. Further cost reduction, ease in storage, distribution and report making followed by better analysis and presentation are other advantages.

IN-TEXT QUESTIONS

21. Which of the following terms best defines the kind of analysis that transforms massive volumes of data into one or more summaries?

(*a*) Analysis

(*b*) Conversion

(*c*) Aggregation

(*d*) Sorting

22. _____best describes how data is moved from an old system into a new one, such as a payroll system.

3.17 Summary

The chapter thus gives us an insight into how data is gathered, organized and used to give informative outputs. As we say, data files can be organized in various ways by analyzing the usage category of the data. Apart from organization and storage, we also learned about databases and their relevance in real-world scenarios. Data is not just limited to information view; it is also used in programming to read, write and

Notes

process information, thereby introducing us to the Input-Process-Output analysis that data goes through to provide meaningful solutions.

3.18 Answers to In-Text Questions

1. Application software
2. True
3. (*b*) System Analysis
4. Requirement Analysis
5. Software Development Life Cycle
6. (*a*) Collaboration testing
7. (*d*) Does not work well for smaller projects
8. (*c*) Linear Model & Prototyping Model
9. Records
10. File organization
11. (*b*) Records are stored in sequential order according to a search key
12. Online Analytical Processing
13. (*a*) Database
14. (*b*) Diamond
15. Flowcharting
16. (*a*) Print files on paper
17. (*a*) Data connections
18. (*b*) Abstraction
19. Procedural language
20. Integer
21. (*c*) Aggregation
22. Conversion

Notes

3.19 Self-Assessment Questions

1. Briefly explain the phases in the SDLC process.
2. State the advantages and disadvantages of the SDLC process.
3. Explain the Spiral model in SDLC. Write its advantages and disadvantages.
4. Discuss the levels in data design.
5. Compare and contrast the following file organizations:
   - Serial files
   - Indexed sequential file
   - Sequential files
6. Explain the differences between the transaction file and the master file.
7. Describe the IPO cycle using a real-world example.

3.20 References

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LESSON

4

PC - Software Packages

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STRUCTURE

4.1 Learning Objectives

- Provide basic knowledge about the PC - Package software.
- Get familiar with the term 'Operating System' and it's working.

Notes

- Explain about WINDOWS as interface.
- Gets the essential information about the text processing software in brief.
- This chapter will help you to learn the spread sheet software with its applications.
- Will be able to work on the database and graphical representation of spread sheet.
- Target the Data base manager working and its connectivity with different software.
- Tell how to work with the presentation software and its applications.
- Usage of all PC – Software packages.

4.2 Introduction

Economic conditions and computerization in every field of human life gave birth to different kinds of software. The availability of low-cost hardware and the expansion of software industry for small to large-scale enterprise have resulted into a wide variety of software packages. Due to this growth, the previous approach of custom software has changed. Off-the-shelf software has been more widely employed as the variety of software packages with the boom in the industry. Although market offers a large variety of software packages, still there are barriers in the selection of the proper PC package for a particular need of the enterprise. Due to the immense amount of information available on the internet, understanding of the PC package and decision process of choosing a package is difficult. Locating sources of information which describe software packages and ways of effective usage of software packages for specific requirement is important. The types of PC packages are described here and their compatibility the operating system. This chapter describes the different software applications and operating system (windows). It also tells about different usage and applications of the PC packages.

Notes

4.3 Operating System - An Interface

Operating system is also called as "System Software', that acts as an Interface between the computer hardware and the user. Every system has at least one operating system to interact with the computer system and different application programs. Applications like Browser, MS Office, Games, Notepad etc., need to work with the help of operating system.

The basic purpose of an operating system is to provide working platform to execute different application programs in efficient manner and manages the allocation of computer hardware as well.

4.3.1 *Benefits of Operating System*

- User-Friendly Interface for the computer system.
- Source of computing provided by it for different programs.
- Sharing Resources is possible only by the operating system.
- Data Protection the other usage of operating system for system.
- Multitasking is another important working of operating system.
- Updated of software is possible through operating system.
- System Error can be recognized with the help of OS.

4.3.2 *Components of Operating System*

- Management of processes.
- File Administration.
- Network Management.
- Main Memory Management.
- Management of Secondary Storage.
- Management of I/O Devices.
- Security Management.
- Command Interpreter System.

Notes

4.3.3 *Types of Operating System*

- Batch Operating System.
- Time-Sharing Operating System.
- Distributed Operating System.
- Embedded Operating System.
- Real-time Operating System.

4.3.4 *Examples of Operating System*

- Apple macOS,
- Microsoft Windows,
- Google's Android OS,
- Linux Operating System, and
- Apple iOS.

Now we have very important problem of choosing the operating system. We already have multiple operating systems in the environment. Although it would be nice to stick on one, it is rarely possible anymore. It's very important to keep in mind that "choosing" operating systems directly is not a simple. In fact, it's a decision that is made almost indirectly based on some important factors and issues. Specifically, which applications are in use by the enterprises, which hardware (workstations, servers, handheld, and mobile devices) is required to support, and what the specific needs of users are often determine which operating system(s) will be use.

4.4 Windows - An Operating System

Windows is a graphical operating system developed by Microsoft. It was released for both home computing and professional works. It is one of the most popular operating system in the world. It enables users to save data, watch videos, run applications, play games, and connect to the Internet. The first independent version of Microsoft Windows, version 1.0, released on November 20, 1985, achieved little popularity.

Now, Microsoft's offerings are dominating both, the server market (Windows Server 2003 and 2008) and the desktop market (Windows XP, Vista, and Windows 7). Windows has also step inroads in the smart phone with Windows Phone but has not been as successful as others. First Version was released in 1985 and there have been many versions of WINDOWS released since. Due to the popularity, most application vendors will first write their software to support Windows; many won't even consider writing their application on any other OS platforms. However, because of its prevalence, it is also the preferred platform for hackers and virus creators to go after.

4.4.1 *Applications of WINDOWS*

- Controls the backing store and peripherals such as scanners and printers.
- Deals with the transfer of programs in and out of memory.
- Organizes the use of memory between programs.
- Organizes processing time between programs and users.
- Maintains security and access rights of users.

4.4.2 *Salient Features of WINDOWS*

- Speed is basic feature of windows for booting speedily.
- Compatibility of windows with other platforms and applications is widely appreciated.
- Lower Hardware Requirements are well compatible with windows.
- Search and Organization is introduced with windows very well.
- Safety and Security of data and computer system is at higher level with windows.
- Interface and Desktop with windows are significant and displays customizable features.
- Taskbar/Start menu of windows provides many grouped items and tiles.

Notes

4.5 Text Processing Software - An Introduction

Text processing is the process of analysing and sorting of textual data into valuable information. Text editing and word processing are two important features of automated information. To work with these two features, text editor and word processor are combined software. Text editor provides the ability to add, delete, update, remove etc. with text and word processor helps in formatting the text or document. It also works with colours, special symbols, shapes, graphics etc.; editing, printing, and saving.

After a long period, the typewriter has gone and rewarded with computer systems with text processing software *i.e.*, word processors. Nowadays, word processing is the most common and popular application software. There are so many word processors available in the market and allow users to work through a document with its principle activities. Text processing has many steps or set of activities as described below:

4.5.1 *Creation of Document*

The creation of document includes making of new file, entering text into it, inserting of different templates, shapes, symbols and different types of graphs etc.

4.5.2 *Editing of Document*

The editing of document is act of making alterations in the content of the document. This act includes insert, delete, reviewing, find & replace, cut/copy/paste, spelling check, and much more.

4.5.3 *Formatting of Document*

For the document, formatting means developing, updating and altering the appearance of a document. Formatting of document has been done manually, but word processing software provides different tools and techniques.

4.5.4 *Output of Document*

Word processing software provides various types of output such as printing option, projecting the document with the help of projector; document can be scan with the scanner, creating of web document and in last but not least is the saving of document is necessary first.

4.6 An Introduction to Spread-Sheet

The spread-sheet was created in 1978, for the financial purpose in the form of tables. The spread-sheet allows users to enter data and formulas into rows and columns arranged as a grid on a display screen. The electronic spread-sheet is most popular for the enterprises and business organizations. Spread-sheets are commonly used for maintaining student grade cards, tracking investments, creating and tracking budgets, calculating loan payments, estimating project costs, and creating other types of financial reports and much more. This is an application which is used to manipulate the data especially arithmetic data. Spread-sheets are more collaborative than other tools of this kink. It's easy to manipulate, analyse and organise the data. It can be integrated with certain other tools. Spread-sheets are quick and easy to add into a workflow.

Besides performing basic arithmetic and mathematical functions, spread-sheets also provides built-in functions. Spread-sheet also provide conditional expressions, functions to convert between text and numbers, and functions that operate on strings of text. Nowadays, spread-sheet software have multiple interacting sheets and can display data either as text and numerals or in graphical form. It also provides powerful data optimization and management solutions that can be integrated throughout accounting, marketing, and development teams, just to name a few.

4.6.1 *Features of Spread-Sheet*

- Data Management.
- Rows & Columns.
- Formulas & Functions.
- Data Filtering & Visualization.

Notes

- Cell Definition
- Custom Formatting

4.6.2 *Advantages of Spread-Sheet*

Spread-sheet is quite popular among the organisations all over the world due to:

- Spread-sheets are free for usage.
- Spread-sheets require less training and skills.
- Spread-sheets are customizable.
- Calculations are streamlined.
- Provides multiple user interaction.
- Can integrate several sheets as well as files.
- Compatible with different types of formats.
- Collaborative with different sources of data.

4.6.3 *Disadvantages of Spread-Sheet*

Apart from advantages spread-sheet also holding the disadvantages as:

- Lack of security of data.
- Countless templates create confusion in the spread-sheet.
- Spread-sheet integration with certain tools create mess.
- Time consuming.
- Unfit for remote working.
- Consolidation among workbook is difficult.

4.6.4 *Uses of Spread-Sheet*

As spread-sheets are most popular all over the world, and apart from many disadvantages everyone is using. So, its important and basic uses are as follows:

- Financial working in organisations.
- Accounting purpose in the offices.

Notes

- Use for analysis.
- Use for presentation of data with various tools.
- Generating reports and charts.
- Assisting with data exports.
- Statistical analysis.

4.6.5 *Best Examples of Spread-Sheet*

- MS-Excel.
- Google-sheets.
- Libre-Office Calc.
- Air-table.
- Smart sheet.
- Zoho-sheet.

4.7 Spread-Sheet - Applications

There are a number of features and applications that are available in Excel to make your task easier. It has total nine menus to work with excel. We start from the initial point of creation.

4.7.1 *Main Working Steps of Spread-Sheet*

- **Create worksheet:** Choose File → New from the menu bar. The New Workbook task pane opens on the right side of the screen. Choose Blank Workbook under the New category heading. A blank workbook opens in the Excel window. The New Workbook task pane is closed.
- **Saving Worksheet:** Choose File → Save As from the menu bar. The **Save As** dialog box appears. Click the Save. In: drop-down menu and locate where the file will be saved. Type a name for your file in the File Name: box. Click the Save button.
- **Closing worksheet:** Choose File → Close from the menu bar. The workbook in the Excel window is closed.

Notes

- **Editing Worksheet:** Editing of excel sheet includes many features as deleting any entry, replacing, copying, moving of data, etc.
- **Printing of Worksheet**

4.7.2 *Formulas & Functions in Spread-Sheet*

Spread-sheet is consisting of many types of formulas & functions (set of pre-written formulas), and it is very difficult to discuss all formulas and their working in single chapter. So, this lesson will consider few of them.

- Mathematical formulas.
- Statistical formulas.
- Engineering formulas.
- Financial formulas.
- Lookup & Reference.
- Logical formulas.
- Date & Time formulas.

4.8 Database Functions in Spread-Sheet

Database functions in spread-sheet are very much popular in the world. Database Function is a routine function, which accepts parameters and performs an action and returns the value. Depending on the Function, the return value can be either a single value or a result set. The Excel Database Functions are designed to help you to work within a database (*i.e.* a large number of organized data records), stored in Excel.

The database functions are for basic calculations, such as sum, average, count, etc., as well as for criteria arguments, that allows performing the calculation for a specified subset of the records in the database. Other records in the database are ignored.

4.8.1 *Types of Functions in Spread-Sheet*

- **SUM:** SUM function adds set of numbers and returns the sum of these values. The syntax of the function is: SUM (number 1, [number 2], ...).

Notes

- **Product:** Product function returns the product of a set of numerical values. The syntax of the function is: Product (number1, [number2], ...).
- **Power:** Power function calculates a given number, raised to a supplied power. The syntax of the function is: Power (number, power).
- **SQRT:** SQRT function calculates the positive square root of a number. The syntax of the function is: SQRT (number).
- **ABS:** ABS function returns the absolute value of a number. The syntax of the function is: ABS (number).
- **MOD:** MOD function returns the remainder of a division between two Numbers. The format of the Syntax is: MOD (number, divisor).
- **Round:** Round function rounds a number up or down, to a specified number of decimal places. In other word, this function removes decimals rounding up the last decimal if the next one is 5 or over. The syntax of function is: Round (number).
- **Lower Function:** Lower function converts all alphabets in the string to lowercase. If there are characters in the string that are not letters, they are unaffected by this function. Syntax- Lower (Text).
- **LEN Function:** LEN function returns the length of text string. Syntax-LEN (text).
- **Concatenate Function:** Concatenate function joins together a series of text strings or other values, into one combined text string. Syntax - Concatenate (text1, [text2], …).
- **Today Function:** Today function returns the current date from the computers system clock. Syntax- =TODAY ().
- **Now Function:** Now function returns the current date and time. The NOW function is only updated when the spread-sheet is calculated. Syntax - =Now ().
- **Date Function:** Date function returns the sequential serial number for the date and formats the result as a date. The DATE function is most useful when the year, month and day arguments are formulas. Syntax- =Date (year, month, day).

Notes

- **MAX Function:** MAX function returns the largest value from a set of numeric values. Syntax- =MAX (number1, [number2] ...).
- **MIN Function:** MIN function returns the smallest value from a set of numeric values. Syntax- =MIN (number1, [number2] ...).
- **Average Function:** Average function returns the average (arithmetic mean) of the numbers provided. Syntax- = AVERAGE (number1, [number2] ...).
- **COUNT Function:** Count function returns the count of numeric values in a set of cells or values. This count includes both numbers and dates. Syntax- =COUNT (value1, [value2] ...).
- **COUNTIF Function:** The COUNTIF function counts the number of values in a range that meet specific criteria. Syntax- =COUNTIF (range, criteria).

4.9 Graphics in Spread-Sheet

Graphical representation of data is an effective visual and impressive tool to represent information quickly and easily. Graphs and charts are commonly used by print and electronic media for the clarity. Sometimes, data can be better understood when presented by a graph than by a table because the graph can reveal a trend or comparison. Spread-sheet is presenting the data with the help of Graphs and charts, to create visualizations of data sets. By highlighting a set of data within spread-sheet and feeding it into the charting tool, users can create various types of charts in which the data is displayed in a graphical way.

4.9.1 *Advantages of Graphical Representation*

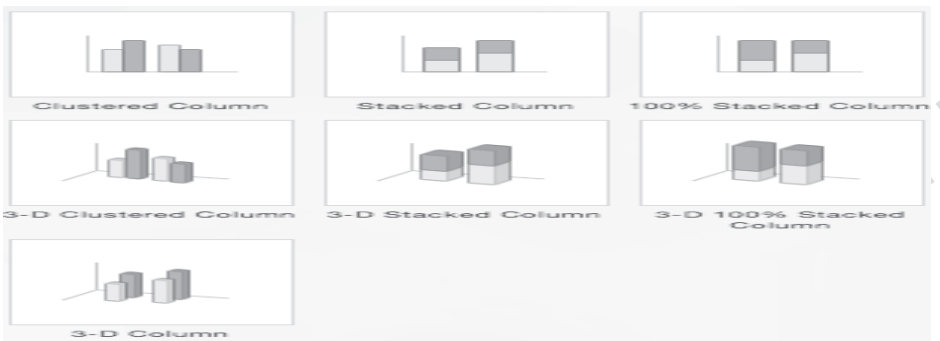
- Through graphs, the data is more presentable and easier to understand as well as draw certain inferences or analysis.
- Graphical representation summarizes a very large data in a very crisp and systematic manner.
- It makes comparison easy of data.
- Visual presentation targets the audience.
- Helps in estimating the key values at a glance.

Notes

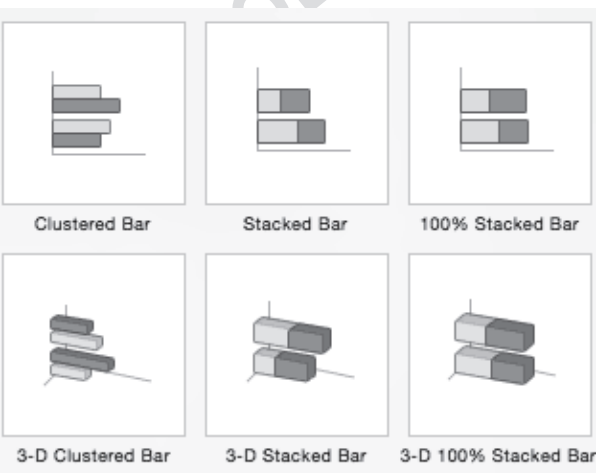
4.9.2 *Types of Graphs and Charts in Spread-Sheet*

There are many types of Graphs and Charts available in Spread-Sheet. These are as:

- **Column Charts:** A column charts uses vertical bars or columns to display values over different categories. They are excellent at showing variations in value over time. It represents different types of column charts.

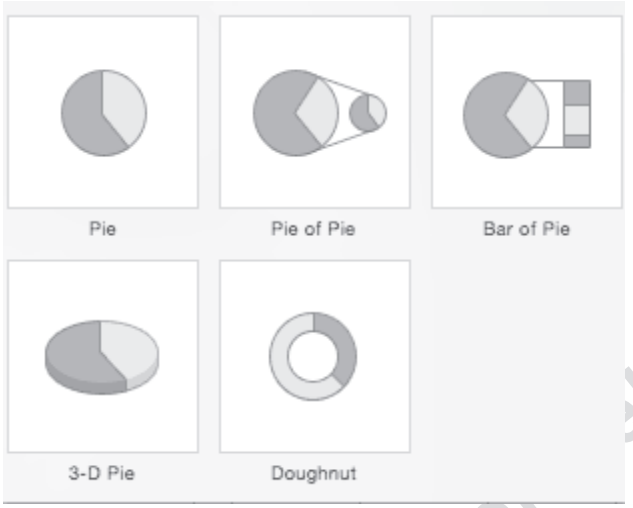


- **Bar Charts:** Bar charts are similar to a column charts, except they use horizontal instead of vertical bars. Like the column chart, the bar chart shows variations in value over time. These charts are again of different patterns.

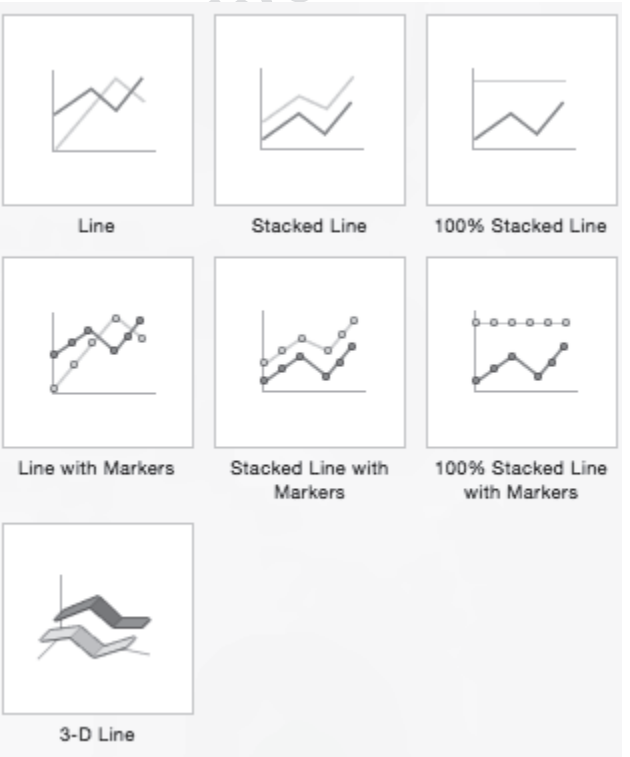


- **Pie Charts:** A pie chart present the contribution of each value to the total. Pie charts are an effective way to present information when you want to represent different parts of the whole, or the percentages of a total.

Notes



- **Line Charts:** A line chart shows trends and variations in data over time. A line chart displays a series of points that are connected over time. Often used to plot continuous data and are useful for identifying trends.



4.9.3 *Steps for creating Graphs and Charts in Spread-Sheet*

- Select chart type
- Select the data & create chart
- Add chart element as axis, chart title, data labels, legend, trend lines etc.
- Adjust quick layout
- Change colours
- Change style
- Switch Row/Column
- Then save the chart

4.10 Database Manager - An Introduction

In Data, 'Data' refers to "information in digital form that can be managed to organise the system. And Database is a collection of related data. The purpose of this type of software is to organise and manage data. The advantage is that changes in data can be made and stored then displayed. MS-Access, d-base, Foxpro, Paradox and Oracle are some of the examples of database manager. Database manager are software systems used to store, retrieve, and run queries on data. They serves as an interface between an end-user and a database, allowing users to create, read, update, and delete data in the database. It also supervises the daily activities of the data i.e., any update or manipulations. These systems help in association of understanding the tools and technology that are available to make the database and related technology even more effective. They also provide basic database management functionalities including creation and maintenance of databases.

4.10.1 *Characteristics of Database Manager Systems*

There are some characteristics of database manager system, which allows smooth working:

- Manage remote as well as local databases.
- Discover databases on web servers.

Notes

- Provide the ability to connect to the database available in the network.
- Provide administrative functionalities.
- Display information from databases catalogs.
- Allow database administrators to new patches for databases and updating databases.

4.10.2 *Basic Functionalities of Database Manager Systems*

Database manager systems enables users and provide quick solutions to the organisation by its functionalities, which are as:

- Sharing of data.
- Faster Accessibility with multiple users.
- Compatibility across platforms.
- Maintain Integrity while sharing.
- Manipulation of data ensures consistency.
- Provides security with different levels of abstraction.
- Following the data models.
- Connected on the basis of distribution system.

4.10.3 *Basic Responsibilities & Uses of Database Manager Systems*

Some of the main responsibilities of Database manager are as follows:

- Creation of efficient and consistent database.
- Determination of data storage structure.
- Facilitates data searches.
- Maintain integrity among assets.
- Manipulations are required.
- Simplifies consultation process.
- Control undesired movements in the data.

4.10.4 *Examples of Database Manager Systems*

- SQL server
- Oracle
- My SQL
- TeamDesk
- TablePlus
- Azure
- IBM Informix
- MS Access

4.10.5 *Basic uses of Database Manager Systems*

- On Demand online video streaming.
- Personnel cloud storage.
- Social Gaming.
- Telecommunication.
- Knowledge management.
- RDBMS.

4.11 Presentation Graphics - Introduction

Presentation Graphics is a way of presentation, which can be used for formal or informal presentation and in any form (text, audio, video, animation or else). In other words, presentation is a structured delivery of information or a way of presenting skills or showing or expressing skills. For the attractive or effective task, presentation is used. Through presentation user can express views, feeling, opinion, etc. Presentation is generally used in business, conference, education system, seminars etc. Presentation can be reproduced on transparency, paper or on-screen. Teachers, professors, politicians and sales representatives make presentations to present their concepts. Some notable presentation software packages are available as Harvard Graphics and Lotus Freelance. PowerPoint is a

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presentation software package included in Microsoft Office suite. It is used to create professional quality presentations.

PowerPoint can be used to work on slides, organize presentation contents with outlines and generate speaker notes and audience hand-outs, helps to structure the ideas and information that may be convey to the audience. It lets to create the contents of presentation by typing/inserting text, pictures, sounds and animations. With it, anyone can add visual images, supporting documents and audio-video recordings to enhance the presentation. PowerPoint makes the creation of any presentation simple by providing built-in professional designs called Auto-Layouts and templates. Different versions of a presentation can also be created for different audiences and contents can be built in either a text-based outline view or a design-based slide view.

4.11.1 *Elements of Presentation*

- **Slides:** Slides are the pages of the presentation. It can also be said that each page of a presentation is known as slide, which includes any text, graphics, titles, shapes, designs etc. PowerPoint provide various views to view the slides, Normal view, Slide Sorter view and Slide Show view respectively these three buttons are available on button left of the PowerPoint window.
- **Notes Page:** While giving presentation, it may need to refer to notes to elaborate on a slide's material, or to remind, to mention some detail. For this purpose, can create a notes for slides used in the presentation this note is available below the slides. Anyone can type any notes, remark or any help message.
- **Hand-outs:** Hand-out is a printed form of any presentation, which can print all the slides used in the presentation is small sizes on a single page. This can print 1, 2, 3, 4, 6 or 9 slides on a page. This can distribute these hand-outs among the viewer during presentation.

4.11.2 *Types of Presentation*

- **Blank Presentation:** With the help of blank presentation, design of the slide can be as per our requirement it gives us some predefined

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layouts of slides which can be used to create a blank presentation. To design the slide by using blank presentation option, select new option from the file menu and then select blank presentation option from the task pane. After selecting blank presentation it gives a default slide. If doesn't want to work with the default slide then select any slide layout. After the completion of one slide to create a new slide click on new slide button from the standard toolbar.

- **Design Templates:** Design templates provide some predesigned formats of presentation, can select any one of them and create the presentation. It can also be said that design formats are directly used to create the presentation.
- **Auto Content Wizard:** The Auto-Content wizard is a presentation, which act as a guide composed of several screens that helps to create a professional presentation quickly and easily. It basically works through series of questions and helps to choose options to create a good presentation with the suggested content. The auto-content wizards give some instruction to the user by following instructions, a new presentation can be created by selecting the category, style, and view of presentation. To use the auto-content wizard, anyone can go through step by step.

4.11.3 *Types of Views of Presentation*

- **Normal View:** Normal view is by default view of the presentation, it contains three panes as the outline pane, the slide pane, and the notes pane. These panes allow to work on all aspects of presentation in one place. And can adjust the size of different panes by dragging the pane borders.
- **Slide Sorter View:** In slide sorter view, are able to see all the slides in a presentation on screen at the same time, displayed in miniature. This makes it easy to add, delete, and move slides, add timings, and select animated transitions for moving from slide to slide. It also previews animations on multiple slides by selecting the slides which want to preview and then clicking Animation Preview on the Slide Show menu.

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- **Slide Show View:** Slide show view presents the slides in full screen mode including all its effects, this view can also decides the time to view the slides. One by one next slide automatically appear after the time frame. Otherwise, can use either mouse click or page down key to view the next slide.

4.12 Applications of Presentation

Presentation software is software used to show information, normally in the form of a slide show and present that slideshow to an audience. Presentation software is the medium of communication for a group of people, much simpler than any other delivery methods. The software helps educators to bring their lessons to life also used to enhance language learning with all four language skills: Reading, Writing, Speaking and Listening. It also helps to create innovative ideas when students come up with creative and interesting slides to illustrate their talk. The use of presentation aids makes more interesting talk, and such aids helps to develop students' confidence.

The software comes with tools and templates to add information in the form of text, images, audio, video, and graphs. It's major functions includes: An editor pane that allows text to be inserted and formatted, a method for inserting and manipulating graphic images and a slide-show system to display the content.

4.12.1 *Types of Presentation*

- **Informative Presentation:** An informative presentation is educational, concise, and to the point. The main goal of an informative presentation is to share information.
- **Instructional Presentation:** An instructional presentation is to give specific directions or orders. This presentation will probably be a bit longer, because it has to cover whole topic thoroughly. In an instructional presentation, listeners should come away with new knowledge or a new skill.
- **Persuasive Presentation:** A persuasive presentation is to convince listeners for accepting the proposal. A convincing persuasive

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presentation offers a solution to a controversy, dispute, or problem. To succeed with a persuasive presentation, presentation should have sufficient logic, evidence, and emotion to sway the audience to your viewpoint.

- **Arousing Presentation:** An arousing presentation is to make people think about a certain problem or situation. To arouse the audience's emotions and intellect so that they will be receptive to the point of view. Vivid language used is in an arousing presentation– project sincerity and enthusiasm.
- **Decision-Making Presentation:** A decision-making presentation presents ideas, suggestions, and arguments strongly enough to persuade an audience to carry out requests. In a decision-making presentation, tell the audience what to do and how to do it.
- **Motivational Presentation:** Motivational presentations in the business world may not be as dramatic or life changing as a TEDTalk, but they still aim to generate interest or gain an audience's approval.
- **Progress Reporting Presentation:** This type of presentation shares status updates, progress towards deadlines, collected data so far, any obstacles popping up, and tasks that need to be added or adjusted. Presentations usually include an agenda, talking points, deliverable updates, discussion topics, and time for questions at the end. This presentation keeps everyone organized and focused, ensuring that everyone is still on the same page and working towards the same end goal.
- **Demonstrative Presentation:** This presentation demonstrates the process if it involves something in which the audience will later participate using the prescribed method.

4.12.2 *Benefits of Presentation Software*

- **Visual:** Visualizing information helps readers for explaining.
- **Versatile:** It incorporates photos, illustrations, sketches, and even videos posted online.
- **Interactive:** This software can embed links and jump around the document itself or out to the Internet.

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4.12.3 *Types of Presentation Software*

Presentation can broadly be classified into different categories as:

- MS-Power Point
- Google Presentation slides
- Canva
- Keynote
- Vizme etc.

4.12.4 *Pros & Cons of Presentation Software*

Every software technology has many advantages and disadvantages, presentation is very useful but consists of many pros & cons.

Pros	Cons
1. Visualization of information.	1. Designs of slides diverts from the information.
2. Versatility in the presentation of information.	2. Information, sometimes in readable form only.
3. Interactive way of presentation.	3. It offers limited tools for entertainment interaction.
4. The presentation provides customization for slides.	4. The customization is not possible for entertainment.
5. It has compatibility across the platforms.	5. Sometimes distraction created across the platforms.

4.13 Applications of PC Packages

PC package is a suite of applications designed to help with productivity and completing common tasks. These are tools used commonly because of accessibility, ease-of-use, interactivity, and adaptability across operating systems. Efficiency is so important for enterprises, can be provided by the PC packages. These PC packages are being able to create, collaborate and communicate seamlessly for the organisations. And having easy access to productivity tools that enable people to work easily from anywhere, which makes organisations agile in their sector. A general-purpose application

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package is **a type of software that can perform many different related tasks** and enhance the productivity of organisation.

4.13.1 *Characteristics of PC Packages*

There are many characteristics of Packages, which fascinates the people and enterprises, are:

- Applications-centric.
- Specialised Programs associated with documentation.
- Standardize and streamline according to the task.
- Customized silent deployment.
- Assistant implementation.

4.13.2 *Categories of PC Packages*

- Database Packages (e.g. MS Access, Lotus Approach, Paradox).
- Graphics Packages (e.g. Paint, PaintBrush, Serif Draw, Corel Draw).
- Computer Aided Design Packages (e.g. 2D-Design, AutoCAD, TurboCAD).
- Presentation Graphic Packages (e.g., PowerPoint, Lotus Freelance).
- Desktop Publishing Packages (e.g., MS Publisher, PageMaker, PagePlus).
- Communication Software (e.g., Internet Explorer, Netscape Communicator).
- Spreadsheet Packages (e.g., MS Excel, Lotus 123).
- Text Processing Packages (e.g., MS Word, Word Perfect).
- Web page editor (e.g., MS FrontPage, Macromedia Dreamweaver).
- Integrated Packages (e.g., MS-Office, Office 365, Open Office).
- Specialist Packages (e.g., Tally, Maxima, SPSS).
- Antivirus Packages (e.g., Quick Heal, Nortan, McFee).
- Build or Tailor-made Packages (in-house developed software).

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4.13.3 *Benefits of PC Packages*

There are many advantages to PC Packages:

- Provide standard environment and ensure stability in working.
- Standards reduce the risks of working and also reduce the support cost correspondingly.
- Packaging is required for the better organisation of tasks, so compatibility is easier.
- Packaging format helps in less business disruptions.
- Application management is smooth.
- Packaging makes effective running of applications.
- Reduce the security risks.
- Customization makes easier working and smooth.
- Accessible from anywhere.
- Communication friendly.
- Centralised collaboration within the organizations.
- Online support and training available.

4.13.4 *Disadvantages of PC Packages*

Any of the system or PC package cannot be without pitfalls and hazards. So some of them are described here:

- **Functional Requirements:** Statement that all the functional requirements of the user can result in selection of an optimal package is a difficult, it is a multi-step procedure. Only after the user requirements have been stated and matched to achieve the best fit to a package can success be insured. Insuring that a package meets the specific requirements of an organization is critical to say.
- **Flexibility:** Technical Environment, laws, policies and procedures constantly change and a software package must be adaptable to these changes, which is very difficult to say. The flexibility which, if anticipated, can readily be built into a custom developed system,

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and should take updates time to time that must be insured in a product.

- **Vendor reliability:** It is very important while selecting a package to insure that the vendor is well established and committed to the product for any kind of updates. This problem is not as relevant to in-house custom developments since an in-house development staff is readily available for support but this is not possible every time and for the long time.
- **Conversion:** A problem can occur with installation of package, is underestimation of the magnitude of adjustment to the conversion or transition to a new package. Using perspective in the selection and acquisition.
- **User Acceptance:** A common encountered obstacle along with the successful installation is user acceptance and adaptation to the new package. Although the package selected may appear to management as a best fit, lower-level staff may be required to significantly alter their routines. Usually, when a software package is purchased, the users are required to arrange current operational procedures so they are compatible with the software.

4.14 Summary

PC Package, basically a synchronisation of interrelated units of the software for the business enterprises for achieving their objectives and fulfil targets. So, Integration of similar type of Software is necessary and important goal to manage processes and systems for better performances. Technology plays important role for the synchronisation of units with less errors and within budget. The availability of low-cost hardware and the expansion of software industry for small to large-scale enterprise have resulted into a wide variety of software packages. There are so many software packages available in the market. But, Applications like Browser, MS Office, Games, Notepad etc., need to work with the help of operating system. So market is also providing many types of operating systems. The basic purpose of an operating system is to provide working platform to execute different application programs in efficient manner and manages the allocation of computer hardware as well.

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WINDOWS is one of the most popular operating system in the world. It enables users to save data, watch videos, run applications, play games, and connect to the Internet. Different types of PC packages are available in the environment to interact with the operating system (WINDOWS). Such as Text Processing Software, Spread-Sheet system, Presentation Graphic software, Database Manager Systems. All these general-purpose application package is **a type of software that can perform many different related tasks** and enhance the productivity of organisation. These software packages are holding many characteristics, which fascinates the people and enterprises. They are divided into different types of categories as Database package, Graphic Presentation package, CAD, DTP, Office suite, communication software package, antivirus and tailor-made packages. All these PC packages comprises of many benefits but are also holding some disadvantages.

After whole discussion, we can conclude that PC packages are required for smooth working with PC and necessary also.

4.15 Self-Assessment Questions

1. What is a PC package?
2. What are the major differences between an application software and a package?
3. Describe text processing with example.
4. How Database Manager systems are different from databases.
5. Explain about presentation graphics systems and their functionalities.
6. Summarize all the PC packages with examples.
7. Discuss the important workings of spread-sheet.
8. Describe operating system as an Interface.
9. Write short notes on different versions of WINDOWS.
10. Discuss different graphic tools of spread-sheet.

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LESSON

5

Management System Integration and Networking

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5.1 Learning Objectives

- Explain different terms as internet, extranet, intranet, networking, data communications networking and Management system integration etc.
- Explain application portfolio development.
- About Internet Technology & Networking.
- Elements of Internet & its applications.
- Usage of Internet Technology for Business Organizations.

5.2 Introduction

Management system is the way of organising and managing interrelated units of the organisation to achieve their goal or objectives. Nowadays, management system integration is basic part of the businesses, in which it combines all aspects of the system, processes, and standards into smart system for better responses. From the point of view of performance, organisations are also into practice to implement application portfolios which helps in effective maintenance.

Analysing, assessing and synchronization of business roadmaps with technology needs some medium. So, Internet is the basic communication medium of organisations. The content of this lesson provides the knowledge of Internet, which accompanied with Extranet, Intranet. Business organisation are integrating their management systems with the help of data warehouses, and providing their own application portfolios with Internet, Extranet and Intranet. This is the way; Internet Technology is widely acceptable in business organisations.

This lesson is divided into many subparts in a systematic manner. First part of lesson describes integration of management system by business organisations with their own application portfolios. Second part of the lesson providing the knowledge of Internet and its usage, with the explanation of intranet and extranet. How the data is communicating in organisation needs the knowledge of Data communication and networking, which is next part of the lesson. Lastly, this lesson describes about the service and application providers of the internet, and conclude the lesson.

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5.3 Management System Integration

The advancement in technology leads to global growth and change into prospective of human life, so the concept of industrial development and business production has changed. Due to these changes, the process of economic growth and competition of markets have led organisations to extend their business segment and more differentiated to stand in the market. Thus, business organisations have developed with management systems with an extensive position in the market in which they operate.

There is a variety of management systems standards, which covers various functional areas of the organisation. With separate and incompatible management systems, organisations can incur insignificant costs, more errors and failures, redundancy, inconsistency etc. These issues have very negative impact on stakeholders, employees and consumers. So, to avoid such kind of prospects, the organisations should have integrated strategy for the management system. It's time to provide a holistic system of integration, and organisations can manage their operations with integrated management system.

The management system integration allows organisations to share work force, information, infrastructural and financial resources. That is an effective management model, promotes innovations.

5.3.1 *Benefits of Management System Integration*

Improvement in the relationship of stakeholders:

- Improvement in procedures of organisations.
- Change in behaviour at environment & safety levels.
- Definition of responsibilities become sharper.
- Reduction in documentation.
- Reduction in indirect cost.
- Better work culture.
- Improvement in employee's communication.
- Increase in speed of processes.
- Globalisation of vision.

5.3.2 *Critical Success Factors*

Critical success factors are those agents or vital areas, which must take into consideration by the organization for successful management system integration, such as:

- Involvement of top management
- Financial and human resource
- Training of personnel's
- Pre-defined objectives
- Persistence of operations
- Set deadlines
- Employee's involvement and motivation
- Experienced consultants

Nowadays, Management System Integration is strategic decision to promote sustainability and competitiveness. For a successful integration level, organisations should follow some set of factors described. And it makes possible to identify a set of benefits for the organisation. Despite that some difficulties also have been pointed out, so should be aware of them.

5.4 Application Portfolio Development

As Information Technology is the most important tool, most of the business organisations are working with that only, has no option. Day by day, number of applications is increasing according to the needs and become substantial assets for the organisations. Consequently, management of these applications becoming less efficient and sustaining at high costs.

According to the business strategies and goals, allocation of aligned IT applications should be business centric and supportive and reflect the impact in the portfolio to the business. So, for the financial benefit of applications, ***Application Portfolio Development*** is required. The Application Portfolio Development is nevertheless a complicated issue to regain the control of the software automation for the business, which ensures about the added value and reliability of the application.

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Application portfolio refers to a collection of software applications and software – based services for the business organisation to attain its goals. The managing of application portfolio is its management. Basically, it's a framework for the software application to illustrate the business benefits of every application integration. Most important benefits of application portfolio development are:

- Eliminate the risks of business & protect it.
- By integration of different applications, lower the costs of IT applications.
- Helps to think strategically for the betterment of business.
- Plan for tomorrow & support future business strategies.

5.4.1 *Application Portfolio Development steps*

Basically, it is a discipline for the governance of software applications through their entire life cycle in support of maximizing business value delivered. Following are the steps:

- Identification of best applications work for the business.
- Create content part of the applications and estimating their operations cost.
- Allocation of applications first, then categorize according to the business strategies.
- Selecting applications with their features and operation for decision making for implementation.
- Lastly, integration of application with credible sources then evaluation of portfolio to maximise business value.

5.4.2 *Silent features of Application Portfolio Development*

Application Portfolio Development is carried out in a balanced fashion, by prioritizing the objectives of business and IT concerns to succeed. The silent features of it are as:

- **Governance Focus:** The focus is only on decision making for higher business value.

- **Development of Application Portfolio:** The Life Cycle of application portfolio is important to lower down the costs and risks.
- **Categories of Applications:** For acquiring governance approach, it is necessary to focus on category of applications
- **Business Value:** The most important objective is to govern the application portfolio driven by changing business needs for maximum business value.

5.5 Internet

The Internet is globally connected computer networks for communication and sharing information. It consists of millions of public, private networks with the global as well as local scope. Networks are linked with a broad array of electronic devices consisting of wireless or wired connectivity. As above said, it is for communication and information sharing, so internet have large volume of information resources and services linked and the infrastructure.

5.5.1 *History of Internet*

The internet is not evolved instantly but is the result of long progressive growth and research.

In 1969, under the American defence department, ARPANET was introduced for communication and exchange of information. With this, use of internet gradually increased in universities, scientists, researchers, and private and commercial organisations for sharing information. In 1990s, the working of ARPANET, and other public, private networks start increasing for exchanging information and messages.

The term "Internet" actually was coined in 1995 by the FNC (Federal Networking Council, USA). Therefore, Internet is a world wide web of computer networks'. It is connected with millions of computing devices that carry and transfer large amount of information from one device to the other. Desktop computers, mainframes, GPS units, cell phones, car alarms, video game consoles and many other devices are connected.

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5.5.2 *How Internet Functions?*

Internet is collection of many public and private networks connected to each other. To avoid any discrepancy and disturbance, networks are governed by certain rules. They are following some common standards, but the functioning of internet is not controlled by any one of them. It is governed and managed by a group of voluntary organisations under the Internet Society. For smooth working of network, they decide some set of rules called as "Protocols", for communication. Other than societies, some networks have their own rules, which they follow internally only within their network, not on global Internet.

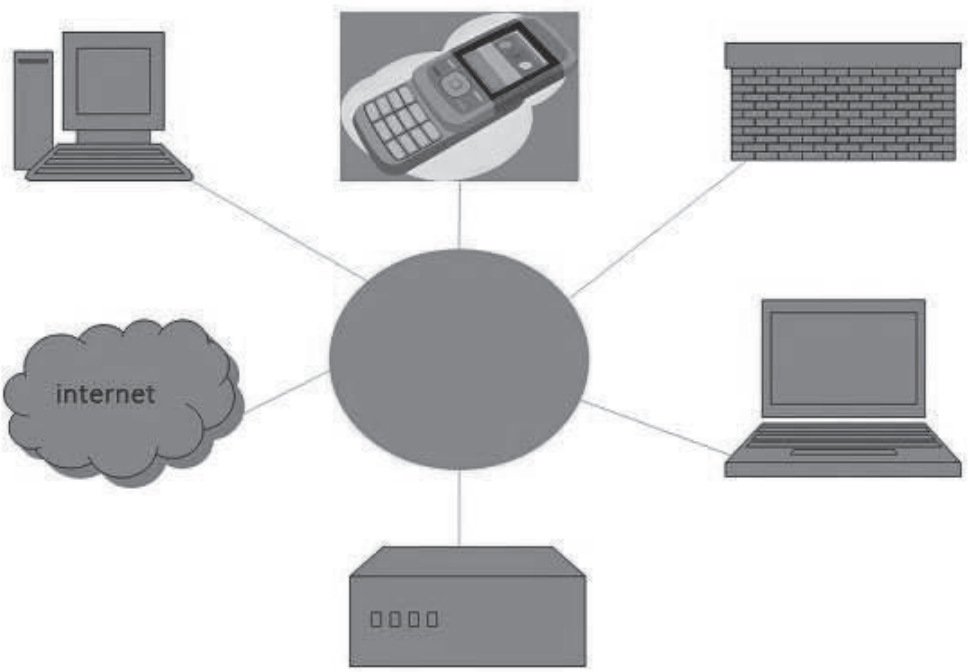

Figure 5.1: Diagram of Internet

5.5.3 *Uses of Internet*

Nowadays, Internet has been the most powerful and useful technology. It works with us, from personal to professional life for the development. Internet helps us to achieve our goals in different ways as, educational purpose, business point of view, research subjects, doctors encyclopaedia, adding information for the home, filtering information for countries.

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Therefore, it is helping out for everyone, in all age, categories all over the world.

Internet is working with the help of web browsers and websites, and then connected through URL within the Domain. There are many web browsers available to serve the user across the world. All working is based on many web-based application software in every field of life for each purpose.

5.5.4 *Limitations of Internet*

Despite of usage and global availability, Internet has many limitations, listed below as:

- Virus threat
- Decrease in face-to-face communication
- Loss/theft of personal information
- Addiction of Internet
- Dangerous for children
- Spamming

5.6 Extranet

Extranet is nothing, but in simple terms 'extension of intranet' only, *i.e.*, a private network of linked many cooperating organisation outside the walls of same organisation. Extranet is providing services with the help of existing intranet interactive infrastructure. So, Extranet is more economical for proprietary network by using same standard servers, clients and web applications as well as browser. Due to the sharing of resources enterprises have strong communication connectivity and typically coupled relationship with common interests.

The usage of Extranet is among various types of businesses such as banking, airlines, railways, hospital chain, mart chain and corporate offices with branches etc. But, extranet is using the Internet protocol and public telecommunication for sharing of information with its any kind of branches. For the security and privacy of extranet, there is a requirement of firewall server management, which providing authentication, use of

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virtual network, usage of encrypted message, for tunnelling the public network. Because companies are more aware about their communication limits with authorised access. So, Extranets serve an extremely important role, as they allow for private communication, collaboration, knowledge sharing, document sharing, and data transfer between organizations.

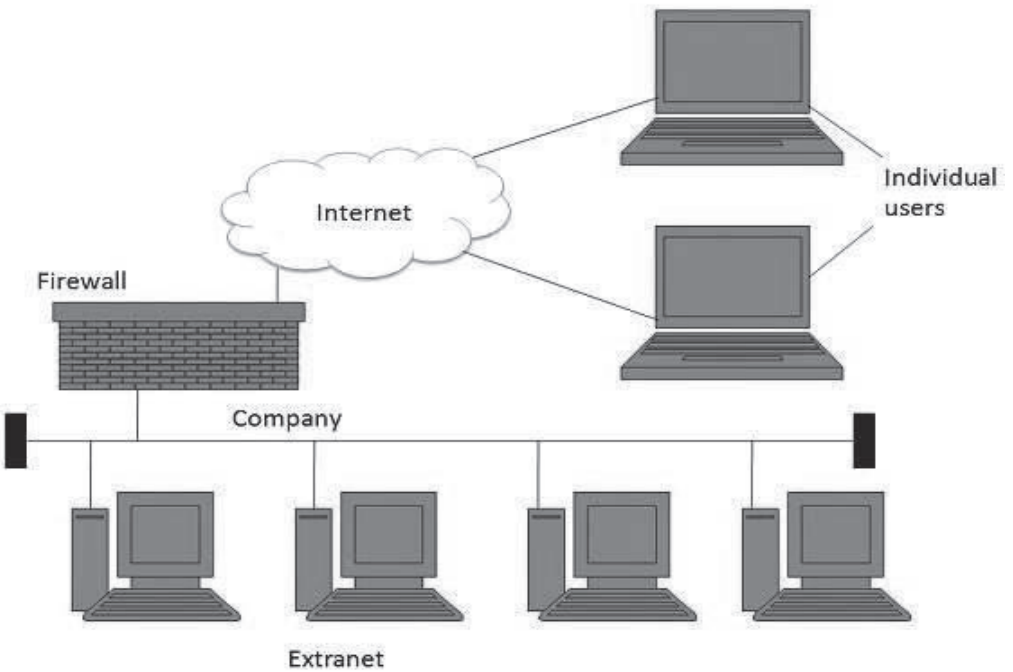

Figure 5.2: Diagram of Extranet

5.6.1 *Features of Extranet*

- Extranet uses the TCP/IP protocol to link intranets at different locations.
- Extranet is providing security and privacy with the help of tunnelling i.e. VPN.
- Access to extranet is limited by agreements of collaborating parties.
- Extranet is open and flexible for supply chain management.
- Extranets are also having facility of replication of database for the safer side.

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5.6.2 *Advantages of Extranet*

Apart from various limitations, extranet have various advantages as:

- Ubiquity of access
- Standards are open for all platforms
- Investment of less time and money
- Technical support and economical
- Act as information factory among the organizations

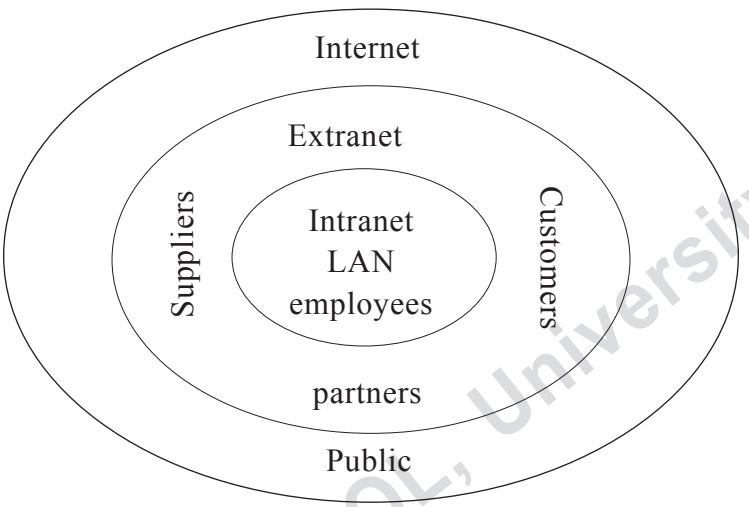

Figure 5.3: Difference of Internet, Intranet, Extranet

5.7 Intranet

Intranet can be described as "Internal Internet", *i.e.*, private network, within the organisation, university, library, enterprise, company, office etc. It is connected with many interlinked local connections with the help of the wide area network in web.

The main motive or purpose of the Intranet is to share and exchange of information within the organisation among internal computing resources. It facilitates the working in groups and for telecommunication. So, it is the web-based architecture for managing internal information with the help of internet tools, protocols, and technology. The working of Intranet

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is accessible through public internet as well as local connectivity with the use of filters and routing algorithms. This intranet is bound to permission to access resources internally for the purpose of security of the network within the organisation.

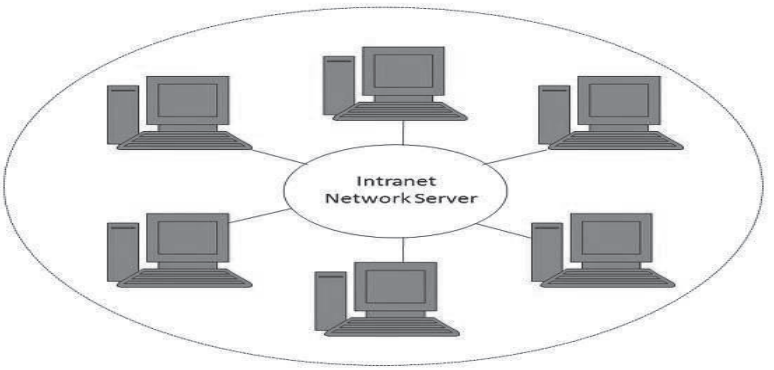

Figure 5.4: Diagram of Intranet

5.7.1 *Features of Intranet*

- Intranet is corporate network secured with firewalls:
- Intranet links various clients, servers, many databases, different application programs (ERP).
- Accessible to authorised people/employees with limited access.
- Connectivity is open and flexible with defined infrastructure.
- Intranet is developed with protocol (TCP/IP) as internet but operates as private network.

5.7.2 *Advantages of Intranet*

Intranets are quite popular among the organisations all over the world due to:

- The interface of intranet is comfortable for multimedia formats.
- The single interface of intranet is enough for several proprietary systems such as database, libraries, bibliographic information, and different management systems.

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- The setup of intranets is very inexpensive for the usage of in-house proprietary packages.
- They provide easy accessibility across the networking platforms.

5.8 Applications of Internet

Today's world is of internet, which fascinates the world. It is used to explore the fascinating and ever-changing world. In this network, more than billions of people are connected. The internet has mainly three applications, which can expand further as:

- Communication
- Buying and selling, services (e-commerce, e-services)
- Searching for information

5.8.1 *Communication*

Growth of mankind began with the advent of communication. We share information, when we are communicating. Sharing of information can be done locally or remotely. Between individuals, generally face to face communication is considered as local communication, whereas communication which takes place over distance comes under remote communication. There are several ways to communicate over the internet. Some of them are as following:

- E-mail
- Instant Messaging
- Social Networking
- Forum
- Video Conferencing
- Audio Conferencing
- Chatting
- News group

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5.8.2 *Buying/Selling, services (e-Commerce, e-services)*

In this, the vendor and customer conduct a transaction sitting at different geographical locations, connected through the Internet. There is a wide range of services provided by the Internet also. These are listed as:

- E-commerce
- M-commerce
- E-services
- Net Banking
- E-learning
- E-gaming
- Communities

5.8.3 *Searching for Information*

A number of programs called search engines are available to search for the information on any topic. Some famous search engines are provided by:

- www.google.com,
- wikipedia.com,
- webopedia.com,
- MSN.com,
- Yahoo.com, etc.

5.9 Internet Technology in Organisations

Advancement in communication and information technology has further strengthened the role of the internet in business. The internet is widely used in organization for marketing and promotion of products and services. The internet is used to deliver customer support, share information and provide training to employees.

The internet used in different applications to meet the requirement of different people at different places in different time. Business organisations are widely using the Internet, for the management of business; they connect and correlate information among organisations'. The main tasks are as:

- Resource sharing
- Information sharing
- Connecting people
- E-commerce
- E-services

The role of the Internet in business communication is varied and has come to be of great importance. It can be used to increase effective communication both internally and externally. Use of the Internet can make it easier to connect with others quickly and more often, in addition to exchanging a wide array of media types. It can be used to communicate purchase information to vendors and by customers to ask questions. The factors that make the role of the Internet in business communication important can also cause conflict, depending on the way the medium is used.

5.10 Data Communication

In Data Communications, 'Data' refers to "information in digital form that can be processed", and 'Communication' means exchanging of information or data from one entity to another entity in a meaningful way. 'Data Communication' is the process of exchanging or transferring of data/ information in two computing devices or more points. It can be explained as the transmission, reception, and processing of digital information. For the effective communication of data, it has some characteristics as:

- Data delivery (data should be delivered to the correct destination)
- Accuracy (delivered data should be accurate)
- Timeliness (delivery of data should be without delay)
- Jitter (network splits the data for easy communication that creates variation in arrival of data packets)

5.10.1 *Components of Data Communications*

There are some necessary components of data communications, which allows smooth communication as:

- Data/Message
- Sender (source)

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- Receiver (destination)
- Transmission Medium
- Protocol

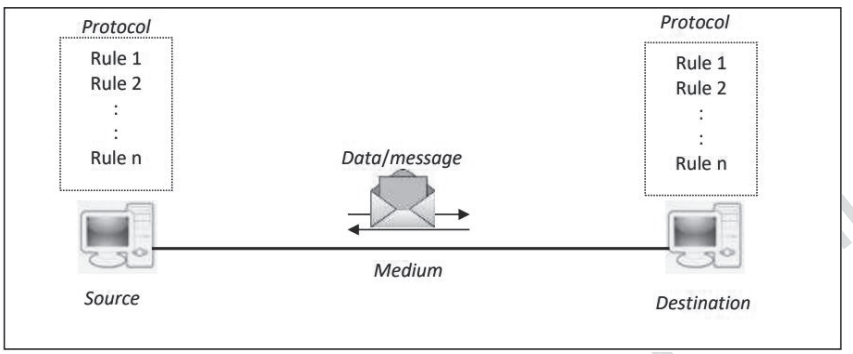

Figure 5.5: Components of Data Communication

5.11 Networking

Networking is the exchange of information or data at a common platform or ground. This can be done for professional interest, social interest or personal. Networking is possible with communication devices interconnected, which is used to transmit with protocols. For the networking computers and more other devices, machines are connecting people for transferring the data/information.

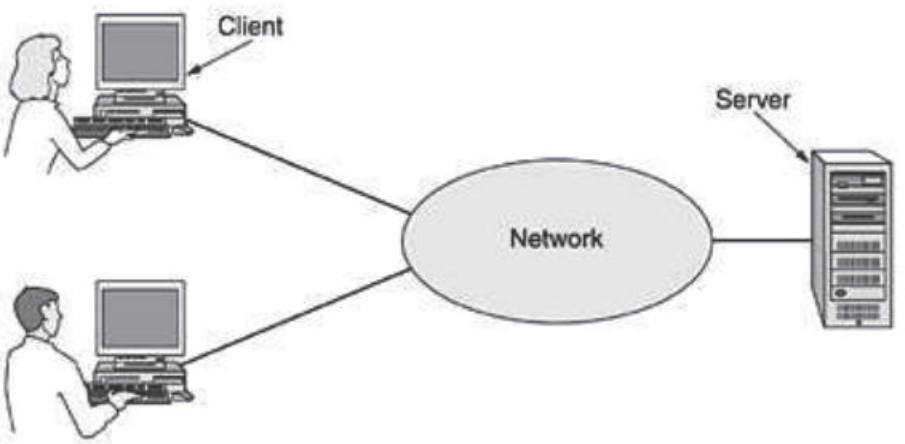

Figure 5.6: Diagram of Networking

Notes

According to the working and geographical structure computers are networked as:

- LAN (Local Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

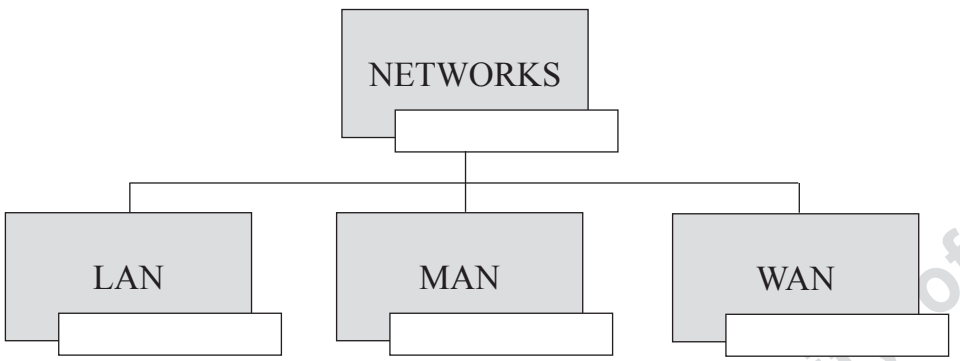

Figure 5.7: Types of Networks

5.11.1 *LAN (Local Area Network)*

LAN is a network, designed to operate small physical areas such as an office, enterprise, factory, home or a group of buildings. It is very easy to design and troubleshoot as well as in exchanging & sharing of information, resources. They all are connected to a single cable in different types of structures. Here, structure means physical structure of connection is called Topology. LAN can be connected in any of the topology as Bus, Tree, Star, and Ring. Usually, LAN connections are privately owned network.

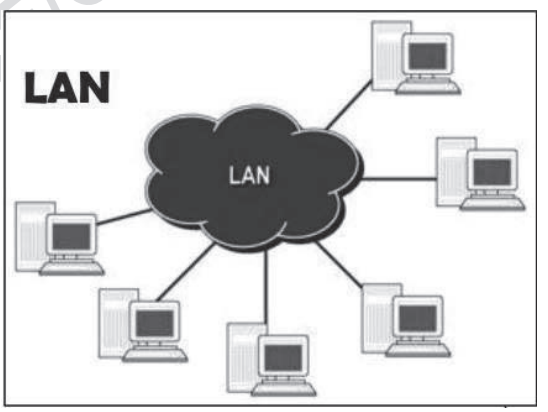

Figure 5.8: LAN network connection

Notes

LAN network connects different computers, mobiles, tablets, printer, and scanner etc., placed at limited distance. The geographical area of LAN network is very limited; range from a single room, a floor, an office, a lab, a school, college or within campus etc. The connectivity of LAN can be done by different means such as cables, fibre optics, Ethernet cables or Wi-Fi.

This type of connectivity is comparatively secure; users can access other computers or resources in the network from the local server distributed. Due to short distance coverage, LAN connections provide the high-speed data transfer rates with very low cost, and usually varies from 10 Mbps to 1000 Mbps.

Over the different advantages, there are many disadvantages also discussed as. Where a lot of terminals are there in the network, then processing speed will be slow. Secondly, if there is any virus in one computer then it will proceed further within whole network. Next, if dedicated server fails, then work stored or shared will not be able to access or use.

5.11.2 *MAN (Metropolitan Area Network)*

MAN is an extended form of LAN network, covers a larger geographical area as a city, a town etc. It is not very easy to design like LAN network, as it covers larger area so troubleshooting is little time taking. MAN network also can be connected to any type of topology as ring, star. These types of connections can be privately owned or public.

MAN network connects different LAN connections in it or with different devices or type of connections at longer distance or in larger network. This type of connectivity can be done through cable, fibre optics, and co-axial cables, PSTN or Wi-Fi. The speed of data transfer is moderate and ranges from 100 Mbps to 1000 Mbps but it considerably less as compared to LAN. It is used to provide link to the shared connection to other networks using WAN. This network typically covers area between 5 Km to 50 Km, although it can be less than that.

A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations. Examples of MAN: Telephone company network that provides a high-speed DSL

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to customers and cable TV network, also used in government agencies and University campuses.

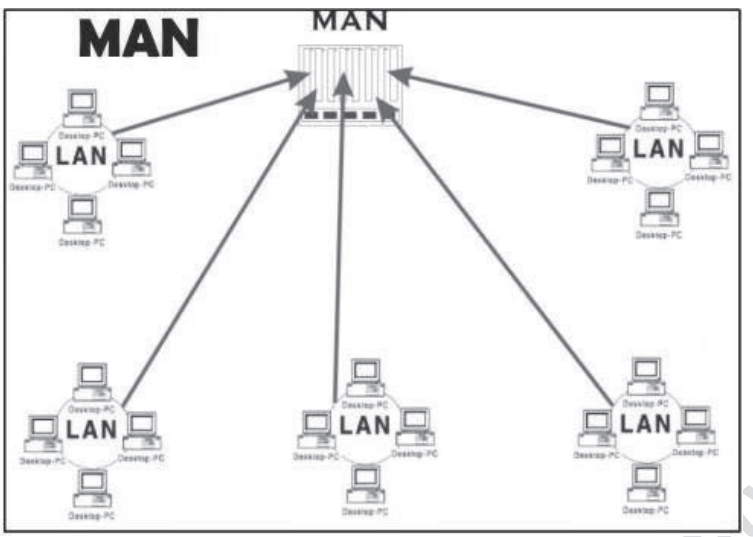

Figure 5.9: MAN network connection

MAN network also holds some disadvantages as it is hard to design and maintain. It is fewer faults tolerant and costlier also for implementing. MAN connection shows much congestion while connecting and working.

5.11.3 *WAN (Wide Area Network)*

WAN (Wide area network) is the largest spread network that covers a large geographical are comprising a region, a country, a continent or even the world. So, it spans over very large-distances and can connect widely separated computer or clients or networks very easily. A WAN can include various LAN and MAN networks or can be connected separately with different types of technologies. It can transfer or transmit any type of data as image, audio, video or any information over the long distances.

The mode of transmission and communication in WAN can either be wired or wireless. Telephone lines used for wired communications and satellite links for wireless connections ranges beyond 100 Kms for connecting huge mass of people. It also facilitates the sharing of regional resource. The communication links provided by the WAN are public carriers like telephone networks, network providers, cable systems, fiber optics, satellites etc…

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Large business enterprises, educational institutions and government organizations connect their different branches/offices at different locations across the world through WAN. The Internet is WAN that connects billions of computers, smartphones and millions of LANs from different continents across the whole world.

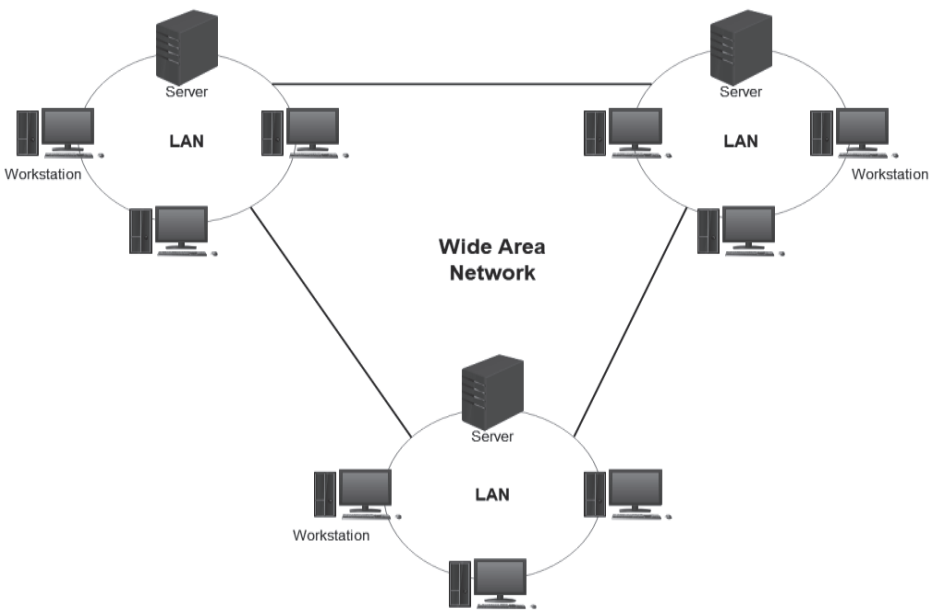

Figure 5.10: ***WAN network connection***

The speed of transferring data is typically low and high propagation delay means speed of communication is low and having higher error rate. WAN network is very complex to design, used in different types of physical structures. It is networked in topologies as star, ring, tree, mesh, bus, or hybrid structure. It is using different types of protocols according to need, speed, span and geographical area such as ISDN, SONET, SDLC, SMDS, HDLC etc…

WAN is using both types of network ownership either private or public. Its types of network are also based on functionality of the network as peer to peer network or client server network. WAN supports transmission media of both types as guided media or unguided media.

Despite of many advantages, disadvantages are more. Firstly, it faces security problems in the network, secondly, higher setup cost, server down

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and disconnection issues are major. Examples, railway reservation system, satellite systems, stock brokerage, banking, e-commerce, m-commerce etc…

Difference between LAN, MAN AND WAN:

S.NO.	LAN	MAN	WAN
1.	LAN is defined as a computer network that links the local areas like schools, universities, organizations, etc.	MAN is defined as a computer network that links the metropolitan areas.	WAN is defined as the telecommunications network that covers a large geographical area.
2.	The full form of the LAN is Local Area Network.	The full form of MAN is Metropolitan Area Network.	The full form of WAN is a Wide Area Network.
3.	LAN is a wired network, *i.e.*, all the computers and printers are connected through wires.	The connections in MAN are connected through modem or cables/wires.	The network of WAN is connected through broadband services, 3G or 4G internet services, etc.
4.	The ownership of LAN is private.	The ownership of MAN might be public or private.	The ownership of WAN might be private or public.
5.	The internet speed of LAN is very high, *i.e.*, 1000 Mbps.	The sped of MAN is moderate, *i.e.*, 44-155 Mbps.	The speed of WAN is relatively less than MAN and LAN, *i.e.*, 150 Mbps.
6.	The maintenance cost of LAN is easy.	The maintenance cost of MAN is difficult.	The maintenance cost of WAN is difficult.

5.12 Internet Service Providers

Internet service providers are for providing internet connection services to individual systems and organisation. In other words, ISP is an intermediary, which connects internet by specialised lines and access to the internet. It is possible through authenticated user ID and password by using modem or other connecting devices. In addition to that they also provide software packages, working platforms and virtual accounts, many other services. ISPs are providing connections in the form of broadband or non-broadband.

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ISP may be of any type as, cable, fibre, DSL (Digital Subscriber Line), and satellite internet. Main functions of ISP are:

- Provide a link
- Hosting

5.12.1 *Provide a Link*

To establish communication between you and ISP, a simple protocol is used PPP (Point to Point Protocol). PPP is a protocol making possible for two remote computers to communicate without having an IP address. So, internet connectivity between you and the service provider is established by the PPP protocol which is characterized by:

- a telephone call
- initialization of communication
- verification of the user name (login or user-id)
- verification of the password

5.12.2 *Hosting*

After establishing communication connection between two remote computers, ISP lends you an IP address for being connected to internet is called 'Hosting'. However, this IP address is not fixed for connecting every time, because ISP has thousands of addresses. Whenever you will connect to the internet with your user id and password, whichever address will be free, you will connect with that. Therefore, connection is a proxy connection, it's your ISP who sends all the requests you make.

5.12.3 *Types of ISP*

ISP can broadly be classified into six categories as:

- Access Providers
- Mailbox Providers
- Hosting ISPs

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- Virtual ISPs
- Free ISPs

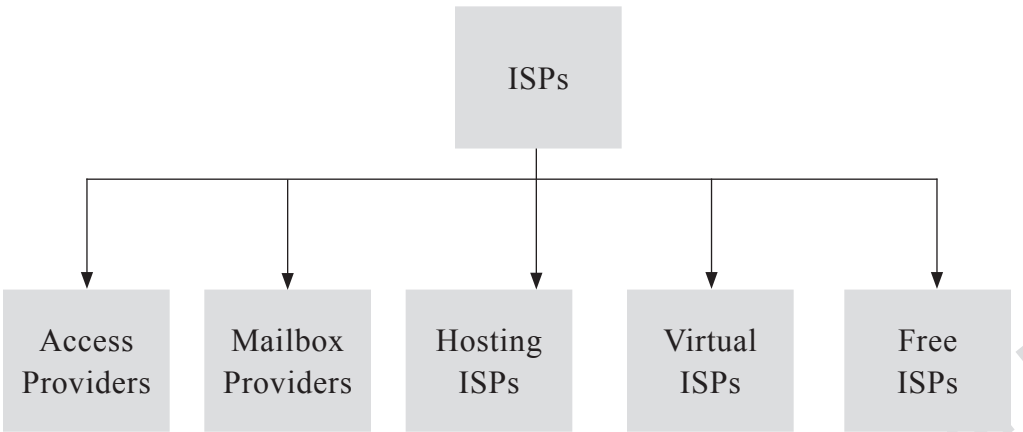

Figure 5.11: ISPs

5.13 Application Service Providers

With the growth of Information Technology & Internet, the term outsourcing came for the expansion of networked infrastructure. Outsourcing led to the emergence of a new model for providing these services, is named as 'Application Service Provider' (ASP). Examples of such applications SAP and FileMaker.

ASP is a third-party application provider, which provides access to different applications, platforms etc. to multiple customers over the network. The service of an application service provider comprises the lease of usage time of software applications they own. It facilitates and manages application software, system hardware and other services on behalf of customers. The main functions of ASP are:

- Outsourcing
- Internet computing
- Packaged enterprise applications

5.13.1 *Characteristics of ASP*

There are many characteristics of ASP, which fascinates the customers, are:

- Applications-centric
- Centrally managed

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- Point to multi-point service model
- Sells application access
- Delivers services based on contract

5.14 Summary

Management system, basically a synchronisation of interrelated units of the business enterprises for achieving their objectives and fulfil targets. So, Integration of Management System is necessary and important goal to manage their processes and systems for better performances. These organisations develop roadmaps for management with the help of technology. Technology play important role for the synchronisation of units with less errors and within budget.

To set goals and incur more profits, organisations are automating their management systems with the help of application supportive technology. The control of the software automation is fulfilled by Application Portfolio Development. All IT applications under application portfolio are business centric, which ensure the value addition & reliability of the application portfolio to attain their goals. These applications are enhancing the development of enterprises.

Analysing, assessing and synchronization of business roadmaps with technology needs some medium. So, Internet is the basic communication medium of organisations. The internet used in different applications to meet the requirement of different people at different places in different time. Business organisations are widely using the Internet, for the management of business; they connect and correlate information among organisations'. The main purpose of internet for the organisations can be listed as Resource sharing, Information sharing, connecting people, E-commerce, E-services etc.

To facilitate the organisations, technology has other options also in the form of Intranet & Extranet. The ***Intranet*** is to share and exchange of information within the organisation among internal computing resources. It facilitates the working in groups and for telecommunication. So, it is the web-based architecture for managing internal information with the help of internet tools, protocols, and technology. The working of Intranet is

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accessible through public internet as well as local connectivity. Extranet is nothing, but in simple terms 'extension of intranet' only, *i.e.* a private network of linked many cooperating organisation outside the walls of same organisation. ***Extranet*** is providing services with the help of existing intranet interactive infrastructure. So, Extranet is more economical for proprietary network by using same standard servers, clients and web applications as well as browser.

5.15 Self-Assessment Questions

1. What is a protocol?
2. What are the major differences between a LAN and a WAN?
3. What IT organization design variables are affected by networks?
4. Pick a specific company, and describe how it might make use of the Internet.
5. What is an Intranet? What is its role in an organization?
6. What is the purpose of a LAN?
7. What is the importance Management System Integration?
8. Explain the need of Application Portfolio Development?
9. Differentiate between Intranet and Extranet?
10. How business enterprises are dependent on Internet Technology?
11. Explain the role of ASP & ISP IN Internet Technology?
12. Explain the use of the Internet in our daily lives.

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Glossary

ARPANET: Under the American defence department, ARPANET was introduced for communication and exchange of information.

ASP: ASP stands for application service providers. ASP offers access to applications and related services over the internet. It provides different software and platforms for work also.

Cloud Computing: Cloud computing is introduced basically for the business environment that provides internet based interactive environment for using virtualised resources such as storage space, software, working platforms.

Computer Generations: Over the time, computer is characterized by major technological changes or development. The characterized technological developments of computer fundamentally changed the working of computers *i.e.*, the way it operates, stores, processes, and results. The sequential changes in computers over the period name it as computer generation.

Computer Programming & Languages: Programming is technical skill of computers which involves designing, creating and refining of code for solving the problems by building applications. For the purpose of programming many computer languages are available for accomplishing the tasks of end users.

CPU: Central processing unit, having arithmetic unit, logical unit and control unit.

Database Manager Systems: They serves as an interface between an end-user and a database, allowing users to create, read, update, and delete data in the database. It also supervises the daily activities of the data *i.e.*, any update or manipulations.

E-commerce: E-commerce is the activity of electronically buying or selling of products on online services or over the Internet.

ERP: ERP stands for Enterprise Resource Planning. It is the integrated management system of main processes, procedure of the organisation in real time and meditated by software technology.

GPS: Global Positioning System is a satellite-based radio-navigation system owned by US govt. and operated by US space force.

Hardware: Physical parts of the computer system, which we can touch and interconnected to each other for performing or solving complex to complex problems.

Information Technology: Information Technology means gathering, storing, organizing, and displaying of processed data.

Notes

Intranet: Intranet is 'Internal Internet' of the organisation. The main motive or purpose of the Intranet is to share and exchange of information within the organisation among internal computing resources.

IoT: IoT (Internet of Things), it is an interconnected network of smart devices using internet, sensors, and RFID for transferring data without human intervention over the network.

ISP: ISP stands for internet service providers. An internet service provider is an organisation of providing internet services. ISP can be organised in various frameworks, such as commercial, community-owned, non-profit organisation.

IT: Information Technology.

LAN: LAN stands for local area network. It is a computer network that interconnects computer clients within a limited geographic range, some of the examples are school, university, laboratory, office building etc…

MAN: MAN is metropolitan area network, a larger network than LAN. It connects systems within the metropolitan area, have covered area of city, town, multiple buildings, etc…

M-commerce: It is Mobile Commerce. According to the Mobile Commerce Forum, "the delivery of electronic commerce capabilities directly into the consumer's hand, anywhere, via wireless technology." So that is possible only through the mobiles.

OS: Operating system is also called as "System Software", that acts as an Interface between the computer hardware and the user.

Presentation Graphics: Presentation Graphics is a way of presentation, which can be used for formal or informal presentation and in any form (text, audio, video, animation or else). In other words, presentation is a structured delivery of information or a way of presenting skills or showing or expressing skills.

Protocol: Organisations under the Internet Society, decide some set of rules called as "**Protocols**", for communication on Internet, for smooth working. Other than societies, some networks have their own rules, which they follow internally only within their network, not on global Internet.

RAM: RAM (Random Access Memory) is that part of main memory where data and instruction held temporarily while being executed.

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Robotics: Robotics is to design machines that can help and assist humans. They need special hardware with sensors and effectors.

ROM: Read-Only Memory (ROM), is a type of memory that comes built into a device during manufacturing and non-volatile.

Social Media: Social media is virtual community within the network, interactive technology that facilitate the creation and sharing of information, ideas, interests, and other forms of expression.

Software: Sophisticated part of the computer system, which we cannot touch and act as interface between user and computer hardware components.

Spread-Sheet: The spread-sheet a software that allow to enter data and formulas into rows and columns arranged as a grid on a display screen.

TCP/IP: It stands for transmission control protocol/internet protocol. It is the set of communication protocols used in the internet and similar computer networks.

Telecommunication: It is the process by which information is exchanged, it includes sharing, transformation, or retrieval of information etc.

URL: URL stands for uniform resource locator. It is nothing more than the address of a given unique resource on the web.

VPN: VPN stands for virtual private network. It is extension of private network across the public network and enables users to share information in a shielded environment.

Windows: Windows is a graphical operating system developed by Microsoft. It was released for both home computing and professional works.

Word Processor: A software that combines, Text editor which provides the ability to add, delete, update, remove etc. with text and word processor helps in formatting the text or document.

978-93-95774-11-6

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