COMPUTERS AND COMMUNICATION TECHNOLOGY

PART I

Class XI

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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FOREWORD

The National Curriculum Framework (NCF) 2005 recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy on Education (1986).

The success of this effort depends on the steps that school principals and teachers will encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognise that, given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults. Treating the prescribed textbook as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. Inculcating creativity and initiative is possible if we perceive and treat children as participants in learning, not as receivers of a fixed body of knowledge. These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required numbers of teaching days are actually devoted to teaching.

NCF–2005 envisages an increase in the optional number of subjects available for students of Classes XI and XII. This textbook marks an attempt in this direction. Its subject matter concerns how we work with computers, rather than about how computers works. It is expected that this textbook will be used with the help of methods of teaching which might enhance the flexible and participatory nature of new communication technologies.

NCERT appreciates the hard work done by the Textbook Development Committee and its Chief Advisor, Professor M.M. Pant, former Pro-Vice Chancellor,

Indira Gandhi National Open University, New Delhi. We are indebted to the institutions and organisations which have generously permitted us to draw upon their resources, material and personnel. We are especially grateful to the members of the National Monitoring Committee, appointed by the Department of Secondary and Higher Education, Ministry of Human Resource Development under the Chairpersonship of Professor Mrinal Miri and Professor G.P. Deshpande, for their valuable time and contribution.

As an organisation committed to systemic reform and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to undertake further revision and refinement.

Director
National Council of Educational
Research and Training

New Delhi
May 2008

PREFACE

Computers have become a way of life in the present day world. That everyone should be educated about the implications of this technology is the need of the hour. Till now NCERT has not proposed a course or brought out a textbook in this area. The course outlined for this textbook is an attempt to design a friendly course that would not only be contemporary but also leave sufficient scope for expansion into unknown realms of computer activity that may emerge in future.

The National Curriculum Framework 2005 recommends that theoretical component of Higher Secondary stage should emphasise on problem solving methods and that the awareness of historical development of key concepts be judiciously integrated into the content of a subject. It also recommends that given the pervasive impact of computer technologies, a course related to this should address this infrastructural challenge seriously and explore viable and innovative alternatives with regard to hardware, software and connectivity technologies appropriate for rural and urban Indian schools.

NCF 2005 states that the book should act as an instrument for achieving social change in order to reduce the divide based on economic class, gender, caste, religion and region. NCF also speaks about tremendous effectiveness of the computer and computing technology in shaping modern society which has created the need for an educated public that can utilise such technology most effectively for the betterment of society and humankind. This book is aligned to these broad guidelines of NCF.

Presumably, this would be a coveted book for "everybody", irrespective of any particular stream of higher secondary stage, for it deals with the real challenges that the discipline is trying to solve. It emphasises development of problem-solving and, equally important, problem – formulating skills. It reduces the importance of technology and underscores the need for learning skills to manipulate the technology. It focuses on some of the real problems that come up with the expansion of the technology – security, piracy and digital identity. Above all, the course focuses as much on the excitements as on the limitations of the new information

technology. Effective integration of information and communication technologies into all curricula assists students in developing the abilities to use, manage, and understand the technologies.

The National Knowledge Commission refers to preparing a work-force adequately skilled and oriented to actively participate in the emerging Knowledge Economy. This book would be a major contributor to developing the skill sets required for all school leavers.

The Class XI textbook contains fourteen chapters under six themes/ units, viz., Welcome to the World of Computers and Communication Technology; Workplace Productivity Tools; Communication Concepts and Skills; Web Publishing Technology; Teamwork and Web Based Collaboration Tools and Emerging Technologies. The book has been conscientiously designed and is the result of the renewed efforts of the Textbook Development Team comprising of school teachers, subject experts, academicians and technical experts from government, non-government and private institutions/organisations. Some of the members worked at the advisory level while others worked towards the actual developmental activity. It is hoped that the students will appreciate the beauty and logic of computers and communication technology. It has truly been a team work.

The course is not biased towards any stream; it can be opted as an elective subject with any other combination, be it science, commerce, arts or humanities. The students may or may not continue to study about computers beyond the higher secondary stage but it seems they will find the inherent logic behind CCT useful in any other branch they may like to pursue, be it administration, social sciences, environment, engineering, technology, biology, medicine or any other branch of knowledge. In order to prepare a child for worldly wise a full chapter is devoted to "Soft Skills for Effective Communication". For those who pursue computers beyond this stage the content of the book will certainly provide a sound base.

In this book we have tried to bring in a conceptual coherence. The pedagogy and the use of easily understandable language are at the core of our effort without sacrificing the rigour of the subject. The nature of the subject of CCT is such that a certain minimum use of mathematics is a must. We have tried to develop the mathematical formulations in a simple and logical fashion as far as possible.

This book has some features which, we earnestly hope will enhance its usefulness for the students. Each chapter is provided with objectives in the beginning and a summary at its end for a quick overview of the contents of the chapter. There are some questions which require critical thinking which would make a student think about real-time application of CCT. Further, a large number of solved examples are included in the text in order to clarify the concepts and/or to illustrate the application of these concepts in everyday real-life situations. Some Practical activities/Case studies have been included which provokes students for deep thinking. Some of these are from real-life situations. Students are urged to solve

these and in doing so, they may find them very educative. Some items inside boxes are introduced in many chapters either for this purpose or to highlight some special features of the contents requiring additional attention of the learners. Some information has been provided in shaded box which is meant for supplementary reading and not for evaluation. Glossary of terms and concepts is given towards the end which will act as a ready reckoner.

Completing this book has only been possible because of the spontaneous and continuous support of many people. We express our gratitude to the Director, NCERT, for entrusting us with the task of preparing this textbook as a part of national effort for improving general/school education. The Head, Department of Computer Education and Technological Aids, NCERT, besides being a member of the Textbook Development Team, was always willing to help us in our endeavour in every possible way.

The draft got excellent academic inputs from teachers, students and experts who sincerely suggested improvement during the development of this book. We are thankful to all those who conveyed these inputs to NCERT. We are also thankful to the members of the Review Workshop organised to discuss and refine the first draft.

We welcome suggestions and comments from our valued users, especially students and teachers. We wish our young readers a happy journey to the exciting realm of CCT.

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Chief Advisor
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The Council thanks Dr. Arvind Kumar, *Director*, Homi Bhabha Centre for Science Education, Mumbai for going through the first draft of the textbook and making incisive comments on the manuscript.

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THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a **SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

Experiencing the World of CCT

1

Objectives

After completing this Chapter, the student will be able to:

- *identify the basic nature of computers and communication technology (CCT),*
- *explain the characteristics of CCT,*
- *describe applications of CCT at home, in education, and in other fields,*
- *appreciate the importance of CCT in real life applications,*
- *notice the changes brought about by CCT,*
- *perceive the problems of the digital divide and*
- *recognise major national organisations' contributions to the development of CCT in India.*

"Technology happens, it's not good, it's not bad."

Andrew Grove

Co-founder of Intel Corporation

Introduction

With an abundance of electronic devices in general and, in particular, with a proliferation of computer-supported technologies and easy access to communication networks, the world today seems to begin with an *e*. It is e-mail, e-learning, e-business, e-content or even e-waste. In short, it is an e-world! Electronics is the dominant technology of our times.

From the wake–up alarm in the morning to the innumerable devices that we use throughout the day all machines are programmed. The programmable machine, the computer, affects almost everybody, in all walks of life. It connects people all over the world, without the distinctions of caste, creed, language and culture, supporting a communication network that was unimaginable before.

1.1 THE WORLD IS CHANGING WITH CCT

All over the world, there is a movement towards an information – based society. Therefore it seems extremely important that the basic nature and overall capabilities of CCT are understood and appreciated by all because ***computers*** are information processing tools and communication technologies enable us to share information. Together they affect all of us. It is also important that we are able to apply the technology tools in our work, whatever our field of work may be.

The way these technologies affect all of our lives include:

- Educational, in the way we learn and shape the course of our learning according to our own interests.
- Technological, in terms of knowledge creation, publishing and distribution.
- Societal, in our living, working and growing and looking at ourselves in a global context.

Today computers are seen as a personal accessory – portable, powerful and simple to operate. They can work in any place and connect us with anyone, any time (Figure 1.1). They are seen as an extension of the human hand and mind and are essential to every field of work.



Figure 1.1 : A man searching for an address

1.1.1 CCT IN HOMES

There are three different types of computers and computer applications that we encounter in daily life. One, those machines which are dedicated to a limited set of tasks. Familiar domestic appliances like washing machines or microwave oven are operated by an electronic device

embedded inside these gadgets. Two, those that are used for specific and limited number of activities, like playing games and other forms of entertainment. The third category includes versatile machines capable of doing a multitude of tasks, including surfing the Internet.

In our day-to-day life, we use various electrical and electronic devices such as computers, digital watches, audio systems, CD and DVD players, washing machines and so on.

Outside home we use lifts, metro trains, coin collection systems in public telephone booths, coffee and tea vending machines and so on. These are mostly computer controlled devices. We do not see the 'computers'; they are embedded inside these devices.

Computers have brought in changes in art and music, photography and animation, editing and publishing. Digital home theatre systems, DVD players, digital music devices of which the computer forms an integral part, makes entertainment low cost and of high quality. The ***Internet*** has emerged as a convenient means of global communication, information sharing and services. The commonest mode of the Internet use includes e-mail, chat, surfing information, banking, reservations and many more. A huge network of millions of computer networks constitutes the Internet. These networks are connected by telephones, underwater cables and satellites.

1.1.2 CCT IN EDUCATION

Computers are widely used in schools, colleges and universities. They are used for computer-aided learning, distance education and administration. E-learning, training programmes and research are other areas of the educational field where computers are put to use.

When a physics teacher wants to show the different positions of a particle in a wave motion, a chemistry teacher wants to illustrate molecular collision or a biology teacher wants to show a beating heart, a mathematics teacher wants to show how a regular polygon approaches a circle when the number of sides tend to infinity or when an economist wants to illustrate an organic market and so on, a computer can effectively simulate these phenomena.

Conventional libraries can be computerised with library management software. It provides facilities to create a database of books, assign accession number, provide content wise, author wise searching facility, verify stock and issue notices. One could also go for digital libraries where books are available in an electronic format and are called e-books. In laboratories, computers are used as tools essential for various processes such as recording, analysing and plotting data for visual display.

From admission to examination, from staff management to parent interaction, from student information to public transaction, computers

make possible automated management and administration of educational institutions. They are used for student enrollment, collection of fees, keeping attendance of student and staff, conducting examinations and announcing results. Besides this, all kinds of information about the organisation are available on the Net so that they can be accessed from anywhere.

Computers also make possible transaction of distance learning courses (often called e-learning). Computer programs or web tools provide step-wise learning. A student can decide the pace of learning for himself or herself. E-learning is flexible and convenient. A student can also attend e-classes. A teacher can supplement classroom instructions by encouraging self-learning of students through e-classes. Quality educational materials such as, online e-books, on line video-audio lectures, career guidance are available at the websites of many educational organisations and universities.

National Council of Educational Research and Training (NCERT), Indira Gandhi National Open University (IGNOU), National Institute of Open Schooling (NIOS) and Central Board of Secondary Education (CBSE) have their own websites which are accessed by thousands of visitors everyday.

National Council of Educational Research and Training

NCERT has its own website (Figure 1.2). Information about the organisation, its programmes and activities, school curriculum and syllabus, information on day-to-day activities of NCERT are available on the site. All NCERT textbooks, including this one (Computers and Communication Technology (CCT); Textbook for Class 11) are available online for reference purposes. Anyone can access these e-books and download from www.ncert.nic.in or www.ncert.gov.in.

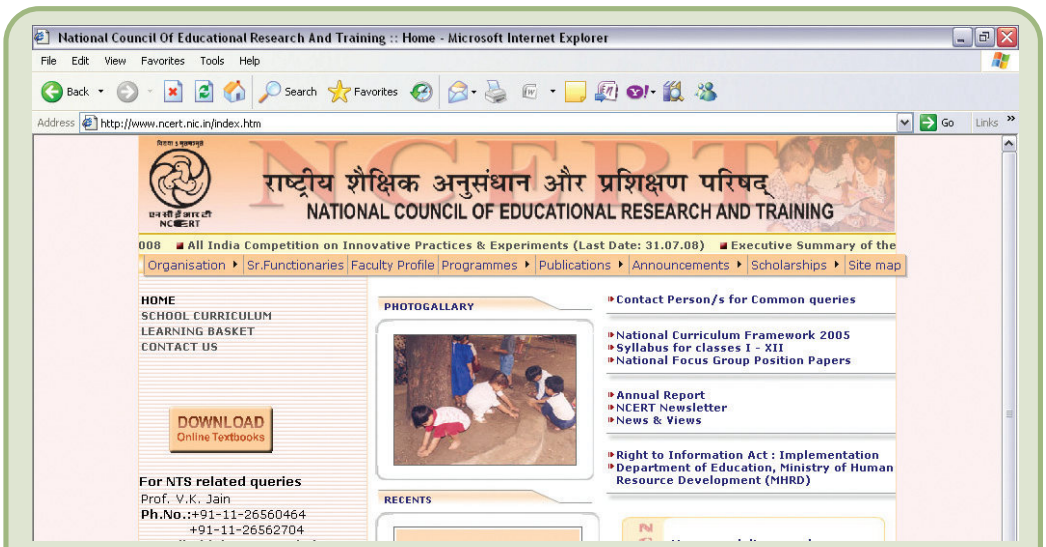


Figure 1.2 : NCERT's website

Indira Gandhi National Open University

IGNOU offers distance education degree programmes in arts, science, commerce, social sciences and information technology. It has democratised higher education by taking education to the doorstep of the learner. It provides educational opportunities to employed persons by offering need–based academic programmes. The courses available are professional and vocational. Above all it is an apex body for setting and maintaining standards in distance education across the country (Figure 1.3).



Figure 1.3 : IGNOU's website

National Institute of Open Schooling

NIOS, which offers 'sustainable and learner centric education,' was established by the MHRD, Government of India as an autonomous organisation for open schooling in pursuance of National Policy on Education. In addition to the general and academic courses, NIOS offers a number of vocational and community oriented courses. The website of NIOS (Figure 1.4) can be accessed at www.nios.ac.in and www.nios.org.

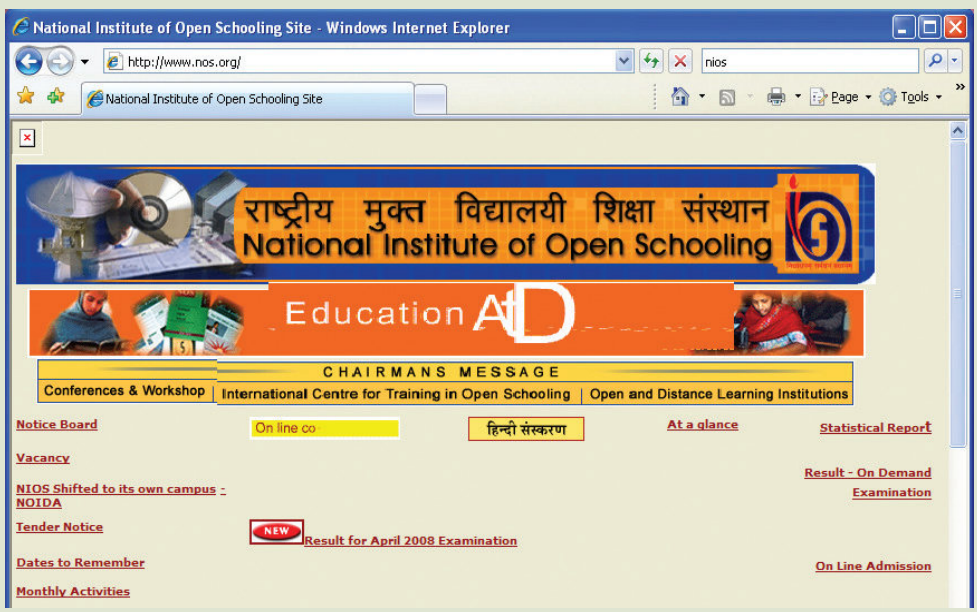


Figure 1.4 : Website of NIOS

Central Board of Secondary Education

CBSE has its own site at www.cbse.nic.in (Figure 1.5). This website provides information regarding admission, courses offered, syllabi, examination results and so on. Various forms like those for admission, rechecking of marks and other purposes can be downloaded from the website. You can fill and submit the forms online It saves time for students and their parents.



Figure 1.5 : CBSE's website

The Ministry of Human Resource Development has designed an education portal* named '*SAKSHAT*: One Stop Solution to Education' (Figure 1.6). This portal caters to the needs of students, starting from elementary students to research, scholars, teachers and life long learners. The portal can be accessed at www.sakshat.ac.in.

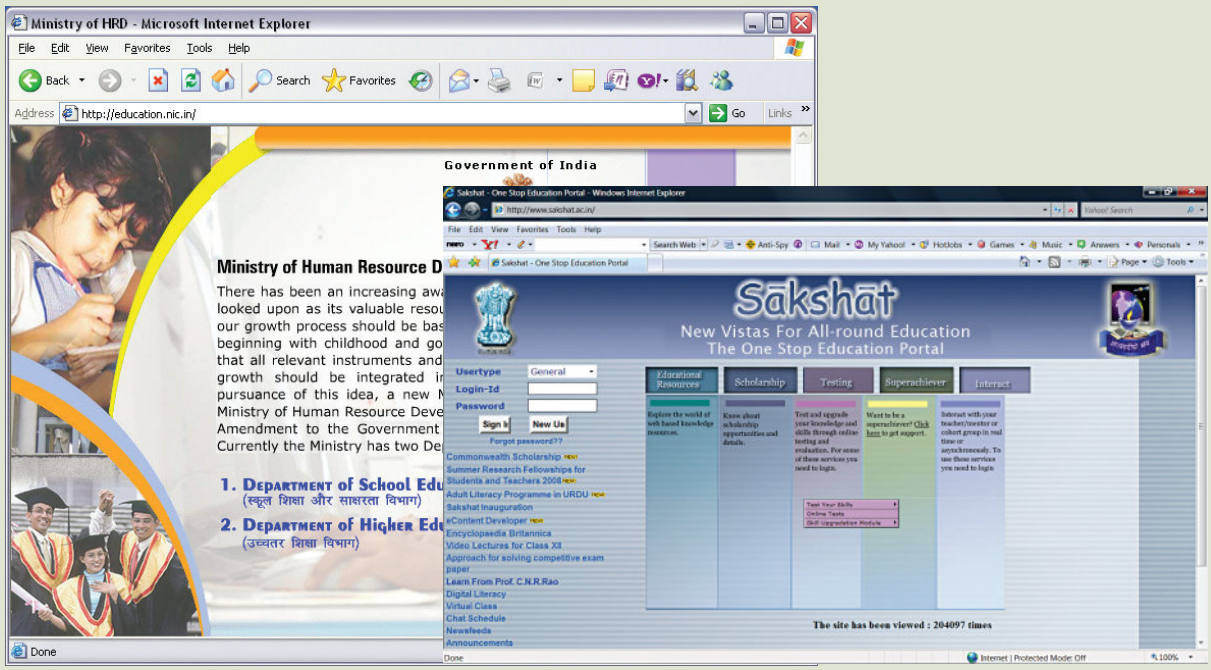


Figure 1.6 : MHRD's website with Portal Sakshat: One Stop Solution to Education – online

*A **portal** is used to describe a website that acts as an entry point or gateway to a wide range of services or resources, usually including a search facility, directory of other sites, news, e-mail, etc.*

Most universities and school boards conduct some online examinations. Compilation of results is computerised using refined statistical tools and facilitating accurate analysis on multiple parameters. The computerised list of candidates has students' photos and finger print identities for computers to assist in detecting impersonation and other malpractices.

1.1.3 CCT in Public Life

CCT offers powerful means to make governance transparent and answerable to the people. Similarly, they can be used to ensure more transparency in business practices.

With CCT working in tandem with other factors that strengthen democracy, such as the Right to Information Bill, we can hope to see increased empowerment of ordinary citizens. CCT could eliminate the role of the intermediary who makes profit by keeping information secret and leaking it selectively to those who please them. Ultimately, CCT may help to balance the sharp socio-economic divides in our society by giving access to those who were kept away from the mainstream due to lack of relevant information.

1.2 CCT AND THE DIGITAL DIVIDE

From a relatively slow-changing, multi-structured society where many disparities co-existed, India is now passing through a period of transition. At such times there is a lot of pressure on society to become homogeneous. That is when the inequities between different sections become all the more evident.

One such inequality, called the digital divide, separates those who have access to the digital world (computers and related technologies) from those who do not have this access. While one section of young people may have access to CCT at home, at school and in their mobile phones, the majority may get a chance to experience CCT only occasionally. It is obvious that the ones with the advantage will keep up with the technological growth while the others would keep falling further behind in terms of information access.

This divide could cause strain, even conflict, in society. However, the tension can be eased:

- if everyone knows what they can get out of CCT,
- if we can cut the costs of access,
- if there are enough public Internet facilities available, and
- if enough sites in Indian languages come up.

We may see a great knowledge revolution in our own lifetime. Access to the global network in particular and acquaintance with communication network may help us realise a new kind of freedom – to think independently, collaborate with others to solve common

problems, to realise what we want and need for ourselves and not what uptill now someone else thought was good for us.

1.3 CCT AND E-COMMERCE

E-commerce employs computers in different areas of commerce such as marketing, customer visit, product browsing, shopping basket checkout, tax and shopping, receipt and process order while e-business offers services pertaining to processing transactions, documentation, presentations, financial analysis, home based services, inventory management and gathering product information using CCT.

All leading banks, including the State Bank of India (Figure 1.7) provide Internet banking facility. With this facility one can check account balance and perform bank transactions from anywhere. We can see account details, pay a bill and print account statement online. Also, the bank provides SMS alert service, so that, whenever bank transaction takes place, an SMS is sent by the bank to our mobile phones.

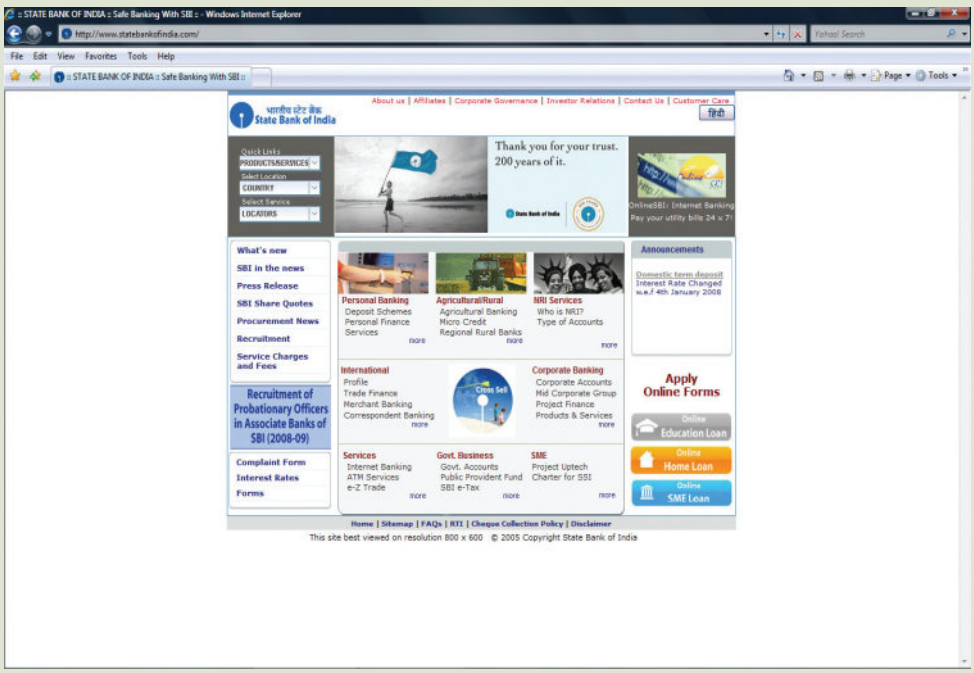


Figure 1.7 : Web Portal of State Bank of India

*The digital nature of CCT results in **convergence**.*

Text, photos, statistical tables, maps, music, movies are all produced digitally, in that they are coded and made up of zeros and ones. This makes it convenient to bring them together onto common platforms. They can be brought into play, interchanged and transformed, and also circulated digitally.

1.4 MAJOR NATIONAL ORGANISATIONS WORKING IN THE AREA OF CCT

1.4.1 National Informatics Centre (NIC)

National Informatics Centre (Figure 1.8) of the Department of Information Technology is providing network backbone and e-governance support to Central and State Governments, Union Territories administrations, districts and other government bodies in India. It offers a wide range of ICT services including Nationwide Communication Network for decentralised planning, improvement in government services and wider transparency in national and local governments. NIC assists in implementing Information Technology Projects and is also responsible for bringing computerisation in the lives of the Indian people.



Figure 1.8 : NIC's website (www.home.nic.in)

1.4.2 National Association of Software and Services Companies (NASSCOM)

NASSCOM (Figure 1.9) is the premier trade body and the chamber of commerce of the IT-BPO industry in India. It is a global trade body with more than 1200 members who are broadly in the business of services, products, IT infrastructure management, R&D services, e-commerce and web services, engineering services, offshoring, and animation and gaming.

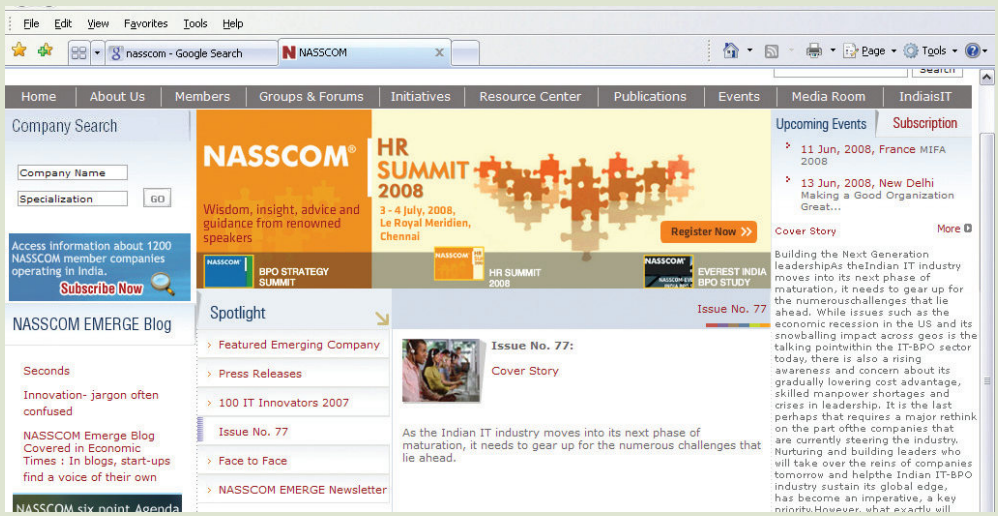


Figure 1.9 : NASSCOM's website (http://www.nasscom.in)

1.4.3 Department of Information Technology

Department of Information Technology (Figure 1.10) is under the Ministry of Communications and Information Technology, Government of India. Its main objective is to make India a global information technology super power and a front-runner in the age of information revolution, to bring the benefits of electronics to every walk of life and to develop the Indian electronics industry as a global player. Its website has an important portal, viz., The India Portal (www.india.gov.in), v'single window access' to information and government to consumer services to be electronically delivered from all state sector institutions and organisations. It provides multilingual content and had received the Best e-Governance Award in Technology at the national level announced by the Computer Society of India (CSI) in 2006.



Figure 1.10 : Website of Department of Information Technology (http://www.mit.gov.in/)

Summary

- Powerful technology is within our reach.
- It has overpowered the limitations of time, distance and money.
- CCT links people all over *irrespective of distances between them.*
- CCT has changed our life pattern.
- Computers have been useful at home as appliances, supporting entertainment/games and for surfing the Internet.
- CCT are capable of contributing a lot to education, buiseness, e-governance, etc.
- Easier access to CCT can help bridge the digital divide.

EXERCISES

1. List some other uses of computers at home which are not mentioned in this chapter.
2. List different activities performed by a corporate house using computers.
3. Visit any nearby industry and list the use of computers there.
4. List the advantages of computer usage in an industry.
5. List the advantages of computers in commerce.
6. Observe your school carefully and list different departments where computers are used. Also, state the purpose for which they are used.
7. List the advantages of a digital library.
8. Check which library management software is used by your school ?
9. List the advantages and disadvantages of e-learning.
10. List the advantages of using computers in design and drawing.

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3. www.wikipedia.org
4. www.encyclopedia.com
5. www.onelook.com

Education

1. www.ncert.nic.in and www.ncert.gov.in
2. www.sakshat.ac.in
3. www.ignou.ac.in
4. www.cbse.nic.in
5. www.nios.ac.in
6. www.education.nic.in

Internet Banking

1. www.onlinesbi.com

Travel Planning

1. www. Indianrailways.gov.in
2. www.india-airlines.nic.in
3. www.yatra.com
4. www.makemytrip.com

Searching

1. www.google.com
2. www.search.yahoo.com

Physics

1. www.jhuapl.edu
2. www.ioffe.rssi.ru
3. www.fzu.cz
4. www.nplindia.org

Components of CCT

2

Objectives

After completing this Chapter, the student will be able to:

- *trace the evolution of computers,*
- *describe the computer and its devices,*
- *list the components of a computer system,*
- *compare various input and output devices,*
- *classify various ports,*
- *understand different storage devices,*
- *recall the evolution of communication technology,*
- *explain computer languages and their development,*
- *compare various types of software and*
- *interpret steps involved in programming.*

I think it's fair to say that personal computers have become the most empowering tool we've ever created. They're tools of communication, they're tools of creativity, and they can be shaped by their user.

Bill Gates

Introduction

In the first chapter we were introduced to a device that has changed the way we work, live and play. Only once in a lifetime does a new invention come about to touch every aspect of our lives in this way. This incredible invention is the computer.

The electronic computer has been around for over half a century, but its ancestors have been around for 2000 years. However, only in the last 40 years has it changed society. From the first wooden abacus to the latest high-speed microprocessor, the computer has changed nearly every aspect of our lives for the better.

2.1 HOW DOES ONE PERCEIVE THE COMPUTER?

Let us take a tour to the Computer Laboratory of our school. We may see an assemblage like the one shown in figure 2.1. But then we have also seen laptops. What differences do we notice? Let us gather information about devices that look different from these but still are computers.

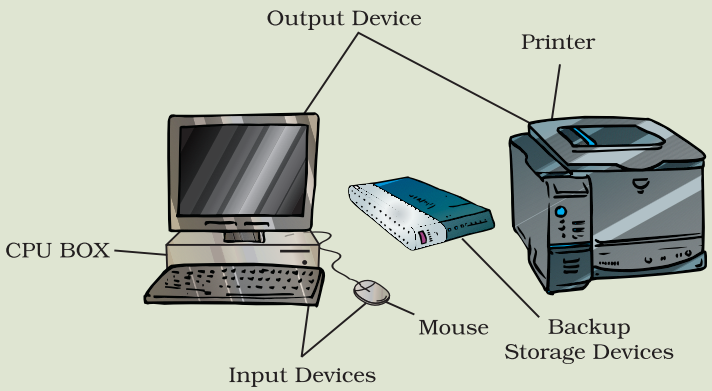


Figure 2.1: A Computer System

Computer indeed derives its name from its essential function, namely, to compute. In a rudimentary sense any computation requires primary data and operations performed between them. This would mean receiving data, processing them, keeping in memory the data at different stages of operation, having some set of data that is fundamental to all operations and giving outcomes of operations. Hence, essentially a ***computer*** means a system of components (i) to input data and display output i.e. Input and Output devices; (ii) processing unit called the Central Processing Unit (CPU) and (iii) the Memory space which can be Read Only Memory (ROM) or Random Access Memory (RAM). One should realise that it is not the external appearance by which a computer is understood in as much as its functionalities.

In fact, the memory in terms of capacity (space) and speed, and the processing capacity of the CPU (speed with which it processes) characterise computers and distinguish them. Also the manner in which data is presented determines a classification of computers, namely, analogue or digital computers.

2.1.1 Classification of Computers

Computers can be classified into two major types based on their way of handling data. These are as follows:

1. **Analogue Computers :** They work on continuous variables like waves of the signal, their amplitude, etc.
2. **Digital Computers :** They work on the principle of binary digits i.e. 0 and 1. Any value or symbol is represented through a binary value.

Hybrid Computers : They are a combination of good features of analogue and digital computers. Digital counterparts convert the analogue signals to perform Robotics and other Process control. Hybrid computers are used to control air traffic and radar of national defence.

Digital computers can also be classified according to their physical structure (size) and the purpose of their use. Based on capacity, speed and reliability they are classified into three categories:

I. Microcomputer : The term "Microcomputer" was introduced with the advent of single chip large scale integrated circuit (LSIC) computer processors. It is the smallest single user computer and its CPU is a microprocessor. It can perform the same operations and can use the same type of instructions as other computers. These are the most frequently used computers, better known by the name "Personal Computers."

Types of Personal Computer

In our everyday use, the term "computer" refers to digital computers, a typical example being the common personal computer (PC). These can be classified mainly as Desktop Computers, Laptop Computers, Palmtop Computers, Personal Digital Assistant (PDA), Tablet PC, etc.



Figure 2.2 : Desktop Model

Desktop Computers

Desktop computers are larger and not meant to be portable. They usually sit in one place on a desk or table and are plugged into a wall outlet for power. The case (chasis) of the computer holds the CPU. When this case lies flat on the desk then it is generally referred to as a **Desktop Model** (Figure 2.2) else when it stands vertically on the desk in the form of a tower, it is referred to as a **Tower Model (**Figure 2.3). The computer usually has a separate monitor. A separate keyboard and mouse allow the user to input data and commands. The main advantage of tower models is that there are fewer space constraints, which makes installation of additional storage devices easier.



Figure 2.3 : Tower Model

Laptop

This is a small, portable computer (Figure 2.4), small enough that it can sit on the lap. Nowadays laptop computers are also called notebook computers.



Figure 2.4 : Laptop

Hand-held Computers/Palmtop

This computer is smaller than a laptop. It is so small that it literally fits in a palm, hence, referred to as palmtop (Figure 2.5). Because of their small size, most palmtop computers do not include disk



Figure 2.5 : Palmtop

drives. Compared to full-size computers, palmtops are severely limited, but they are practical for certain functions such as phonebooks and calendars. Sometimes these are also called pocket computers.

Personal Digital Computers/Assistants

Palmtops that use a pen rather than a keyboard for input are often called PDAs (Figure 2.6). This is a hand–held device that combines computing, telephone fax and networking features. PDA can function as a cellular phone, fax sender and personal organiser. PDA was pioneered by Apple, which introduced the Newton Message Pad in 1993.

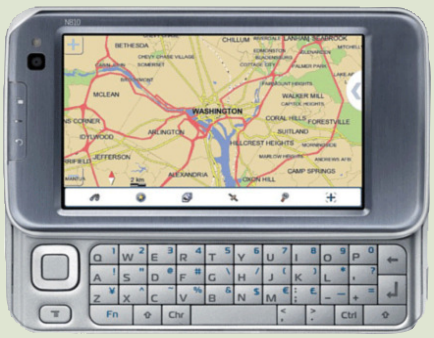


Figure 2.6 : Presonal Digital Assistant

Tablet PC

It is a notebook slate-shaped mobile computer (Figure 2.7) which is equipped with a touchscreen or graphics table which allows the user to operate the computer with a digital pen or stylus or fingertip. A wireless keyboard can be connected to this for extensive text input. Other models of tablet PCs are convertible model (screen can rotate over the keyboard) and hybird model where the screen is fixed on the keyboard.



Figure 2.7 : Tablet PC

Workstation

A powerful, single user computer, a workstation is like a personal computer, but it has a more powerful microprocessor and in general, a higher quality monitor used in computer aided design and other applications requiring a high end, usually expensive, machine with considerable calculating or graphics capability.

Server

The term **server** actually refers to a computer's function rather than to a specific kind of computer. A server runs a network of computers. It handles the sharing of equipment like printers and the communication between computers on the network. For such tasks a computer would need to be somewhat more capable than a desktop computer. It would need:

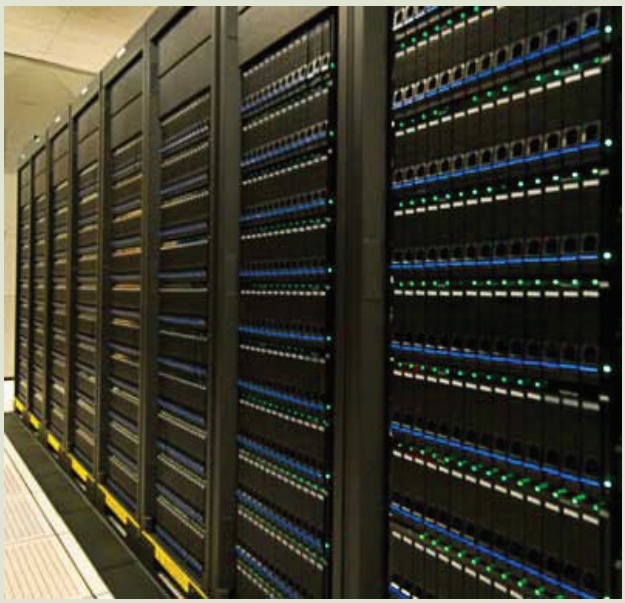
- more power
- larger memory
- larger storage capacity and
- high speed communications.

II. Mini Computer : It is a multiuser computer capable of supporting up to hundreds of users simultaneously. They are usually more powerful compared to microcomputers. Minicomputers are also known as mid range computers as their cost and computing powers lie in the middle range between micro and mainframe computers. Minicomputers are used for multiusers and interactive applications.

III. Mainframe Computer : A powerful multiuser computer, the mainframe computer, is capable of supporting many hundreds or thousands of users simultaneously. They are capable of faster processing and greater storage area. They are used in research organisations, large industries, large businesses and government organisations, banks and airline reservation where a large database is required.

Super Computer

There is another category of computers, the Super Computer which is somewhat similar to the mainframe computer**.** These are largest, fastest and most expensive. They are used for massive data processing and solving very complicated problems like weather forecasting, weapons research and development, rocketing, atomic, nuclear and plasma physics. The processing speed of super computers lies in the range 400-10000 million instructions per sec (MIPS). Examples of the supercomputer are Eka which was developed by the TATA Group, Pune (India) in November 2007. It is the first in Asia and the 8th fastest supercomputer in the world as of June 2008 (Figure 2.8 (a)) PARAM (Figure 2.8 (b)) developed by CDAC in Pune (India), CRAY 3 (developed by control data corporation, JAPAN), SX-3R (25.6 GIGA Flops, NEC make) HITAC S-300 (32 GIGAFLOPS, HITACH make) etc. HITAC S-300 is the latest and the fastest Super Computer.



(a) Eka



(b) Param

Figure 2.8 : Super Computers

2.1.2 Evolution of Computers

Table 2.1 gives a glimpse of the evolution of computers.

Table 2.1 : Evolution of Computers

Electrical Electronic Component	Main Features	Software	Memory and I/O Devices	Type of Computer
Vacuum tubes	Bulky, slow, unreliable, consume more space and power	Machine language and assembly language	Limited core memory,input through punch cards	Analogue
Transistors	Less power consumption, smaller in size	High level languages (HLLs) like FORTRAN, Pascal, COBOL, etc.	Magnetic core memory as main memory, magnetic tapes and disks	Analogue
Integrated circuits (ICs)	More memory capacity, much smaller in size and weight	General purpose HLL, concurrent programming	Semiconductor memory as main memory, hard disks as secondary	Digital
Very large scale integration (VLSI)	Development of microprocessor, more speed and reliability	Webbased technologies, very user friendly and sophisticated, artificially intelligent software	Optical disks, VCDs, DVDs, blue ray disks and high capacity hard disks	Digital
Ultra–large scale integration (ULSI)	Much faster and very powerful	Being Developed	Being Developed	Digital

The future is promising for the computer industry and its technology. The speed of processors is expected to double every year and a half in the coming years. As manufacturing techniques are further perfected, the prices of computer systems are expected to steadily fall. However, since the microprocessor technology will be advancing, its higher costs will offset the drop in the price of older processors. In other words, the price of a new computer will stay about the same from year to year, but the capacity of the technology will steadily advance.

2.1.3 Let us Know the Computer

A computer is basically a device that can respond to a specific set of instructions in a well – defined manner, execute a prerecorded list of instructions (a ***program***) and quickly store and retrieve large amounts of data. Since a computer is understood more by its functions than its appearance, let us see what functions each of the components performs.

2.1.4 Organisation of the Computer System

A ***computer system*** (Figure 2.9) is usually defined as a combination of hardware and software. Computer hardware is the physical equipment. Software is the collection of programs that make the hardware do its job.

Each of the hardware and software components has undergone refinements and modifications depending upon the limitations encountered by the users and the endeavours to overcome these limitations to meet new requirements and challenges. Let us therefore understand the computer from two perspectives, namely, the general functions of its components and the evolution these components have undergone.

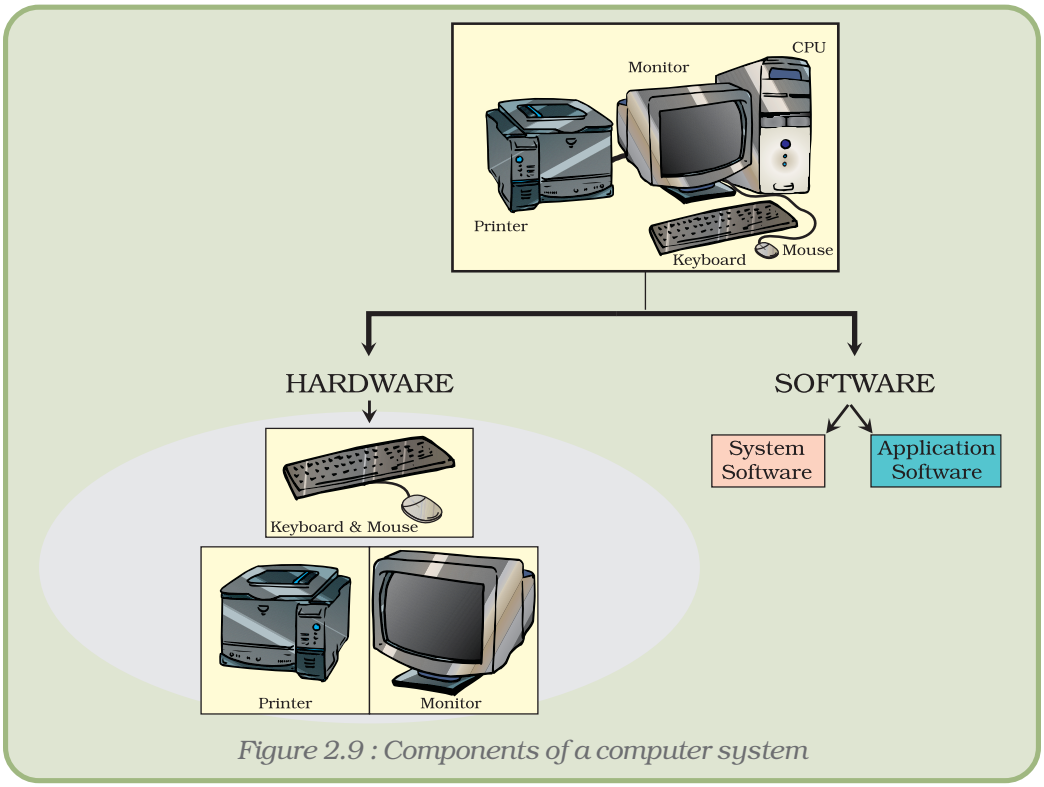


Figure 2.9 : Components of a computer system

2.2 HARDWARE

In order to accomplish a particular task the computer performs a series of jobs, namely, Input, Storage, Processing and Output, which it handles in a very special way as follows:

- It accepts the data (input) from the user.
- The computer has memory chips, which are designed to hold data until it is needed.
- It processes this data into information. The computer has an electronic brain called the Central Processing Unit, which is responsible for processing all data into information according to the instructions given to the computer.
- It then returns the processed information (output) to the user.

For performing each of the jobs listed above, every computer has special parts/components, for Input Device, Storage Device, Central Processing Unit and Output Device.

2.2.1 Input Devices

General Functions

It provides a means for the machine to communicate with its external environment by accepting (or reading) data and the program.

1. It converts the data based on the program into computer acceptable form through an input interface.
2. It supplies the converted instructions and data to the computer system for further processing.

The very scope of computers is enough to understand that there is no limit to the form and type of data that serves as an input. Sometimes the input is in the form of text in normal language, sometimes it is a picture, sometimes it is a voice input like a song. Selection of an appropriate input device will improve efficiency and keep human interaction minimal.

Types of Input Devices

On-line or Direct Data Entry Devices : These devices are under the control of the CPU and communicate directly with the CPU, that is, these are connected via cable to the CPU. This process of data entry may be time consuming and may have errors but by using these devices, we can avoid having to capture data from paper. These are also known as **Interactive Input Devices** and are classified as:

(a) Keyboard
(b) Locator devices
(c) Interface or pick devices.

(a) Keyboard

The most common input device is the keyboard (Figure 2.10). The modern keyboard generally contains 104 keys and is called the QWERTY keyboard because of the sequence of keys in the top row, which are similar to those of a standard typewriter. A keyboard is used for a wide range of tasks but is well known for its capability to

enter data, which is copied from the original paper documents (such as name and address details on a form). Keyboards are also used for typing letters, memos, reports and other documents using word processing software.



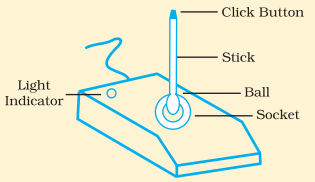
Figure 2.10 : Keyboard

(b) Locator devices

Locator devices are used to control the location or position of the cursor on the screen and they allow us to provide the necessary input. Generally, locator devices are good for gross movement but not for precision work. Different locator devices are discussed in Table 2.2.

Table 2.2 : Various Locator Devices

Name of the Device	***Description***	***Picture/ Diagram***
Mouse	It is a small hand-held device used to indicate a position or movement on a computer's display screen by rolling it over the mouse pad/flat surface. There are different types of this device like physical, optical and laser mouse. Physical mouse works on the principle of the movement of a ball, whereas optical and laser mouse works on the bases of light signals (i.e. have no mechanical movement inside.)	
Trackball	It is a movable ball mounted on top of a stationary base, which can be rotated manually using a finger and it also has two buttons like a mouse for performing operations similar to mouse. Three dimensional track balls are available that allow the movement not only the traditional left/right and forward/ backward movement but also up and down as well.	
Touch pad	It is a flat touch sensitive rectangular surface performing similar operations as a mouse or a track ball.	
Mouse, track ball and touch pad are point and click devices and are used to start the task by positioning the pointer, selecting and dragging items/objects. They can also be used to draw various simple/complex graphic images/pictures.		

Digitising Tablet	Digitising tablet is an electronic plastic board, on which specifying a location corresponds to a location on the computer screen. It is considered to be an absolute locator because it is very precise and when a stylus (pen) is placed in a particular position the same signals are produced each time. It is in this that it differs from other locator devices. Digitisers are used by architects and engineers in Computer Aided Designing (CAD) for designing buildings, cars, mechanical parts, robots, etc. Moreover, they are used in the Geographical Information System for digitising of maps.	
Joystick	Joystick is a wired/wireless control device which is usually used for playing video games. These are relative locators in which the direction of the push determines the change of position and the amount of deflection determines a change of speed (*see* Figure). A joystick not only indicates two dimensional positions by moving the ball rotationally but also three dimensional position, where the third dimension is indicated by the rotation of the rod. Games software, flight simulators, etc. often use joystick as the input device.	 

(c) Interface/Pick Devices

Pick devices are used to select an object on the screen. The object may be text or graphic. Examples of pick devices are light pens and touch screens.

Light Pens

The light pen is a pen-like light-sensitive device that feeds a narrow electrical pulse generated by a pointing device directed towards the screen. It is connected by a wire to the computer terminal that detects the signals from the screen. Light pens may be used in place of a mouse or a keyboard, particularly for menu based applications where an option may be selected by pointing on it. They are used for Computer Aided Designing (CAD) and drawing purposes. Moreover, with the help

of a light pen, engineers, architects or fashion designers can draw and edit the designs directly on the screen, though for editing a drawing keyboard may be used to select colours, lines with varying thickness, cropping or enlarging the drawings. It is also used to read bar codes from products that are available in big departmental stores.

Touch Screens

Touch screens are monitors on which the user makes selections by touching the screen, rather than moving a cursor to the location with external locator devices.

Touch screens are often used in situations where users are likely to have a low level of competence in using computer keyboards. Touch screens are sometimes used in restaurants, building societies and travel information systems.

Source Data Entry Devices : We have observed that in grocery stores, the clerks merely wave the product over a laser scanner/barcode reader, which automatically enters the product code and retrieves the corresponding price of the product automatically. The earlier practice was to enter the code/ product name by using a keyboard (a time consuming process). The laser scanner/barcode reader comes under Source Data Entry Devices category, which increases the efficiency of a user. These devices help us in entering the data directly from the source, without any human intervention.

The devices used in this category are:

(a) Video digitiser
(b) Digital camera
(c) Scanning devices
(d) Voice input
(e) Remote control
(f) Magnetic stripe reader
(g) Sound sensor – microphone
(h) MIDI instrument.

Source Data Entry Devices

(a) Video Digitiser

A video digitiser captures television pictures from devices such as a TV set, video camera or video recorder and converts them into a digital format that a computer can use for display, storage or general manipulation. A video digitiser is an ideal tool for capturing images from real-life scenes to incorporate into computer work. It is used to convert still or moving images into a digital format required for computerised presentation. Taking video pictures or frames from video files is known as 'frame grabbing'.

A video digitiser may be required for video conferencing. (If a digital video camera is used there will be no need for a video digitiser.) It can also be used to make television advertisements and pop videos, etc.

Advantages

- Video digitisers allow us to capture real-life images which are often more appropriate than drawings.
- Captured images can then be transferred to paper.

Disadvantages

- A fast computer with a large memory capacity is required to cope with the large amount of data involved.

(b) Digital Camera

A digital camera (Figure 2.11) stores images (digital pictures) in the memory and does not use celluloid films as in the case of ordinary cameras. Each digital picture is made up of thousands of tiny dots, called ***pixels*** (picture elements), and the camera stores data about the colour of each dot. The picture quality is determined by the number of dots representing a specific picture. The resolution of the image is expressed in Dots Per Inch (DPI) defines. Higher the DPI, better the resolution . Most cameras allow the user to choose the resolution needed for a picture. Once the photograph is stored in the camera it can be transferred to a computer where it can be edited, printed or more permanently stored. Some cameras store images on a floppy disk or memory card so that they can be easily transferred. Other cameras are connected to the computer with a lead (cable) and special software is used to transfer the image.



Figure 2.11 : Digital Camera

Advantages

- There is no developing cost, no film is needed and we can insert images directly into a document on the computer.
- You can edit, enlarge or enhance the images.
- An image can be saved with multiple shots and the best one can be saved. That is, there is no wastage like a miss-shot in ordinary cameras.

Disadvantages

- Digital cameras are generally more expensive than ordinary cameras.
- When the memory is full they can be connected to a computer to download the stored images (or the images can be deleted from memory) before they are used again. This is not as convenient as simply changing a film.

(Some digital cameras overcome this problem by using floppy disks or other storage devices to store images before they are transferred, but floppy disks cannot hold many images and other devices are expensive).

(c) Scanning Devices

(i) Scanner

A scanner is a device which can capture still images or even text, to be stored and used on a computer. The scanner throws a light beam onto the paper and measures the amount of light reflected back by each part of the page. Like a digital camera, the page is split into tiny pixels (dots) and a number representing the colour of each dot is sent to the computer. Scanner software usually allows the user to choose between high and low resolution. Very high quality images take up a lot of memory.



Figure 2.12 : A flatbed scanner

Most scanners need to place the paper on a glass plate inside them for scanning similar to a photocopier machine. These are called flatbed scanners (Figure 2.12) and typically use a charge–coupled device (CCD) as a image senser. This usually come in A4 size or larger (such as A3), but there are also some small hand-held ones (Figure 2.13) often used to read text such as bar codes.

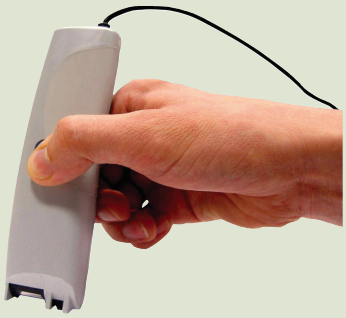


Figure 2.13 : A hand held scanner

Another type of scanners used to capture the highest resolution from an image are called drum scanners (Figure 2.14). These scanners spin the film around on a drum while a fixed laser or other beam of light looks at the art as it spins. The beam is then picked up by a very sensitive vacuum tube called a photomultiplier tube (PMT). This big single, fixed tube is much more sensitive to light than any of the tiny pixels on CCD and therefore can see a broader range of light from white to black. At also sees it without the noise of a CCD. Drum scanners are good because the image is picked up by a much more sensitive PMT.



Figure 2.14 : A drum scanner

Advantages

- Any image can be converted from paper into digital format and later enhanced and used in other computer documents.

Disadvantages

- Images take up a lot of memory space, but it is possible to reduce the size of the data file by reducing the resolution (number of dots per inch) or by using different ways of storing the data i.e., different file formats.

Whether to go for a flatbed or a drum scanner depends upon the objectives of our scanning. Table 2.3 gives the comparison of flatbed and drum scanners.

Table 2.3 : Flatbed Scanners Vs. Drum Scanners

Flatbed Scanners	Drum Scanners
Line-at-a-time scanners	Flying-spot scanner
High end flatbeds scan at resolution range from about 1500 to 5400 dpi	Good drum scanners can resolve 8,000 to 11,000 dpi optically
Illuminate the original with a whole line of light at a time that lights up a long thin strip of the original	Illuminate the original with a tiny spot of light, which effectively flies across the original
Reasonable cost	Expensive
Smaller in size	Very large size

Hand-held digital cameras and camcorders are field scanners because they scan a whole 2-dimensional field at once.

(ii) Optical Mark Readers (OMR)

Optical Mark Readers are able to detect marks on paper. A pre-printed document is prepared for users to select certain areas to put a line or a mark. A document like this is scanned using reflected light to detect dark shadows.

Universities and educational institutes often use pre–printed enrolment forms where students have to enter a mark with a medium or soft pencil. Multiple choice questions in entrance examination papers often require a candidate to make a mark to indicate the answer. The student will pencil a line through the option of their choice. Questionnaires and surveys may also use this technique.

Advantages

Simply selecting and marking a choice in the right location on an OMR form is easier than typing writing in data.

- Documents can be checked evaluated very quickly by scanning them with only a few chances of error (only 2–3% with modern OMR machines).

Disadvantages

- Careful handling of forms is needed. Badly damaged, creased or folded forms may be rejected.
- They can only be used when the data to be input can be selected by marking with lines. Because every option must be catered for, the forms are sometimes not very easy for the user to understand. This may introduce errors.

(iii) Optical Character Readers (OCR)

Optical Character Readers (OCR) are devices that can detect patterns of marks which are in character format (numbers, letters, punctuation and some special characters like '–, @', etc.). Only printed characters can be recognised because it is not easy to cater for different styles of handwriting. The characters are converted by a scanner from picture format into coded characters that the computer can work with. This is normally in ASCII format (American Standard Code for Information Interchange). OCR software can be purchased separately for use with a standard A4 scanner. OCR is often used to scan text for use in a word processor.

Advantages

- When a computerised document has not been saved and only printed text is available, it is possible to use OCR to scan in the text for later editing and re-arrangement.

Disadvantages

- Some characters cannot easily be interpreted and errors occur during conversion. This is especially true if there are a lot of diagrams and characters laid out in a way the software cannot interpret.

(iv) Magnetic Ink Character Recognition (MICR)

Characters which have been printed using magnetised ink can be recognised using a Magnetic Ink Character Reader device. This type of data collection has limited use and it is mainly restricted to banking systems because of the expensive equipment involved. Cheques are pre-printed with some code and account number. When a cheque has been written the data input clerk also has to mark the cheque amount in magnetic ink.

MICR is used for Bank cheque processing.

Advantages

- Fast processing of large volumes of data.
- It is a fairly secure method of data collection as the shape of the characters cannot be changed without expensive equipment.
- This method of input is very reliable as the number of errors generated during the reading of documents is negligible.

Disadvantages

- MICR is expensive to use because special equipment is needed to create the characters as well as to read them.

(v) Bar–Code Readers

Bar-codes (Figure 2.15) are a series of thick and thin vertical lines grouped together. Bar-code readers (Figure 2.16) are the devices used



Figure 2.15 : Bar code



Figure 2.16 : Bar code reader

to input data from such sets of Bar codes. The reader uses a laser beam to read the series of thick and thin lines which represent the barcode number. Almost every product we see on supermarket shelves has a barcode. The barcode is 13 digits long and there are four main divisions. The first part of the barcode (two digits) represents the country, the second part represents the manufacturer's code (five digits), the third part represents the produce code (five digits) and there is a final digit, which represents the check digit. This last digit is a calculated digit to ensure that the barcode is read properly. If there is an error, the reader usually beeps and the operator must key in all the digits manually. When the barcode is read, it locates the correct product on the inventory file, stored on the computer's disc. The price is read from the file and a sale is registered, producing a record on the customer's receipt. The number filed in the inventory file is reduced by one.

Bar codes are used on library tickets, airport baggage labels, books, supermarket products, clothes and on many other retail items. Barcode readers are used in most situations where there is an Electronic Point of Sale terminal (EPOS terminal), for example: department stores, supermarkets.

Advantages

- Fast and accurate data entry.
- It is possible to store all the details about the country of origin and manufacturer as well as the product code itself. These are recorded in a standard format within the barcode.

Disadvantages

- If the barcode is damaged the barcode reader cannot read it. It is then time consuming to enter all the separate digits using a keypad.

(d) Voice input

We can now input data by simply talking into a microphone and using special software to recognise the voice. Users should be trained in the software regarding correct pronunciation of the words before the speech can be interpreted and transferred to the computer. Some computer systems can respond to voice commands and can carry out tasks because the spoken word is interpreted by the software and converted to instructions. These can be used for inputting text to word processing software, controlling devices such as electronically controlled doors and machines.

Advantages

- Voice input is extremely useful for those users unable to use keyboards or mouse.

Disadvantages

- The system must be able to recognise the voice of each user. 'Teaching' the software can be tedious and time consuming.
- Speech recognition software is still not very accurate.

(e) Remote Control

Remote control devices are used for transmitting data when the user is at some distance from the processor. Devices such as video recorders can accept data which is programmed into the system from a remote handset. Special keys for certain tasks or selections are usually found on the handset. An infrared sensor on the main processing unit picks up the signals when keys are pressed. It is used to enter data from a distance.

Advantages

- The device provides the user with the convenience of inputting and working, away from the processing unit.

Disadvantages

- Small remote devices can easily be misplaced.
- The unit and remote need to be quite near to each other and should have no other objects between them which may interfere with the signals sent.

(f) Magnetic Stripe Reader

Magnetic stripes are the dark-looking stripe that may be seen on the back of many plastic cards, for example, bank cards. The magnetic stripe holds data about the owner of the card, a bank card will contain details such as the bank account number (the card owner's individual account number) and sort code (the code that identifies the branch of the bank where the account is held). The device (Figure 2.17) reads the data on the magnetic stripe and money can be taken from the correct account to pay the bill. The money is taken from the bank account, not from the card. Data on a magnetic stripe does not change and there is no balance recorded on the card. It may be noted that the card does not contain details of the credit limit. Magnetic stripe readers are often seen at supermarkets and in many different types of shops, in fact anywhere where there is a 'point of sale' (somewhere we pay for our purchases).



Figure 2.17 : Magnetic stripe reader and debit card

When the data is read electronically, the point of sale is called EPOS (Electronic Point of Sale).

Advantages

- The card can be read many times without damaging the stripe.
- The data is not visible to people because a machine is needed to read the data (although with debit cards the bank details are actually displayed on the card as well).
- Putting magnetic stripes onto cards is not expensive so the cards are quite cheap to produce.
- The data from the stripe is read very quickly and more conveniently.

Disadvantages

- Magnetic stripes may get damaged or the magnetic stripe reader could break down.
- The biggest disadvantage of magnetic stripes is that ordinary equipment can read but not change the data. That is why Smart Cards are gaining more popularity. These cards contain a small chip (or tiny processor with some memory) instead of a magnetic stripe. The data on the chip may then be changed as the smart card is used.

(g) Sound Sensor Microphone

A sound sensor, which is a microphone (Figure 2.18), is a device that detects sound and inputs it to the computer, and then the sound which is analogue in nature is converted into digital format.



Figure 2.18 : A sound sensor–microphone

The person using the computer speaks into the microphone. Speech recognition software on the computer converts what the person has said into text. The text is displayed on the screen and can be saved as a word-processed file. Speech recognition is getting more reliable though it is necessary to spend some time 'teaching' the system to recognise the user speech. Remember, it still does not always make accurate conversions to text.

Some users record special sounds, both voice and music, from any source. These sounds may be used in computerised presentations, for example, multimedia teaching software.

Advantages

- People with a range of disabilities can be benefited from the use of microphones and speech recognition, for example, those who cannot use a keyboard. They can create word-processed documents by speaking instead of typing. Moreover, many devices in the home can now be controlled by voice.

- Recording our own sounds means that we can add spoken messages or music to our own presentations or even e-mails.

Disadvantages

- There should be no background noise while recording, otherwise sound may become distorted. Cutting down the background noise is sometimes difficult and the sound recorded using a microphone is often not very good.
- Sound sampling (converting the analogue sound to digital format using software) often produces very large data files.

(h) MIDI (Musical Instrument Digital Interface) Instrument

It is a serial interface standard that allows connections of music synthesisers, musical instruments and computers.There are a variety of musical instruments such as keyboards, guitars and drums, which send and receive electronic messages. If a musical keyboard is connected to a computer using a MIDI instrument (Figure 2.19), the musical information such as pitch is converted to digital data which can then be stored on the computer.



Figure 2.19 : Musical Instrument Digital Interface

The music industry uses MIDI to input music directly into a computer so that it can be edited and developed, often by mixing it with other sounds which are input from a microphone. Some programs allow its user to enter a tune from a musical instrument, then convert this into written music, which can even be printed out.

Advantages

- Once the tune has been played on the musical instrument, all the details are held on the computer. These details may then be changed. It is possible to speed up the tune, slow it down or even make it sound like a completely different instrument.
- The data stored is very compact and takes up about 1/20th of the space taken up by even the lowest quality recorded sound samples.

Disadvantages

- A musician is required to play the instrument to acquire the input, so some musical knowledge is required.
- To take advantage of the digitally recorded sound, knowledge of software and music is required to edit recorded tunes.

2.2.2 Memory or Storage Devices

Memory is required in a computer to store programs and the data processed by programs.

Computer memory is made up of a large number of cells. Each cell is capable of storing one ***bit*** of information in the form of binary numbers.

Memory System

Memory in a computer system is required for the storage and subsequent retrieval of instruction and data. A computer system uses a variety of devices for storing instructions and data required for its operations. Normally, the information to be stored on a computer is classified in two basic categories – data and instructions.

Although a memory system is a very simple system, it exhibits a wide range of technology. But unfortunately, faster memory is more costly. On the other hand, memories with smaller cost have very high access time. This is the time taken by the CPU to access a location in memory. This results in slower operation of the CPU. Thus, the cost versus access time has led to a hierarchy of memory where we supplement fast memories with larger, cheaper and slower memories. Therefore, memory system may have different types, costs, organisations, technologies and performances. (Figure 2.20)

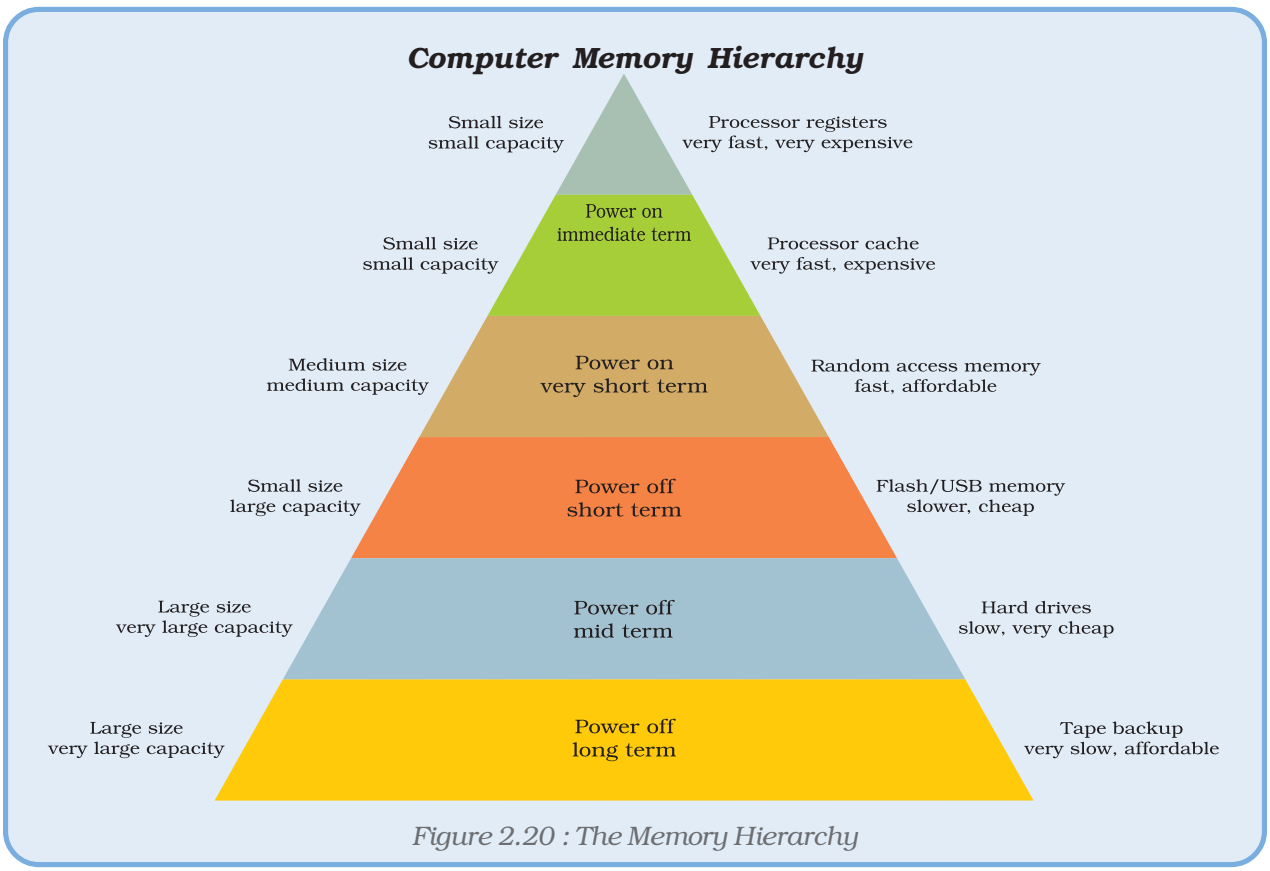


Figure 2.20 : The Memory Hierarchy

Types of Memory

A memory system can be considered to consist of three types of memories. These are as follows:

1. Internal processor memories
2. Primary memory or main memory
3. Secondary or auxiliary memory

Any storage unit of a computer may have the following characteristics:

Storage capacity is the amount of information/data a storage unit can hold. Accessing the data to/from these memories may be fast or slow.

The **speed** and availability of inexpensive memory has had enormous impact on computer technology. The high speed memory devices are more expensive and occupy less space in comparison to the slow speed memory devices.

Internal Processor Memories

These consist of the small set of high-speed registers and high speed buffer memory (cache) which are internal to a processor and are used as temporary locations where actual processing is done.

Register is a small amount of storage available on the CPU whose contents can be accessed more quickly than storage available elsewhere. Processor registers are at the top of the memory hierarchy and provide the fastest way for a CPU to access data.

The important registers, within the CPU are:

*Program Counter (PC). A **program counter** keeps track of the next instruction to be executed.*

Instruction Register (IR) is a register which holds instruction to be decoded by the control unit.

Memory Address Register (MAR), is a register which points to the memory location which the CPU plans to access, either for reading or for writing.

MBR (memory buffer register) which is also referred to as memory data register (MDR) is used for storage data either coming to the CPU or data being transferred by the CPU.

Acculmular (ACC) is a general purpose register used for storing variables, temporary results and results produced by arithmetic logic unit of the CPU.

Besides these, a processor can have many other registers. But these are the most basic and most essential registers necessary for any CPU.

Cache Memory

Cache memory is a small high speed buffer memory used to hold instructions temporarily during processing.

The CPU of a computer system commonly uses cache memory (Figure 2.21) where it holds or buffers the contents of the main memory

because the CPU runs much faster than the main memory. Thus to reduce the waiting time of the CPU the cache is used. Cache memory reduces traditional system bottlenecks because system RAM is much slower than CPU. This prevents the processor from having to wait for a program and data from slower main memory.

A cache typically operates by retaining copies of blocks of storage, each containing recently used information. This memory (or caches) is usually transparent or invisible to the processor.

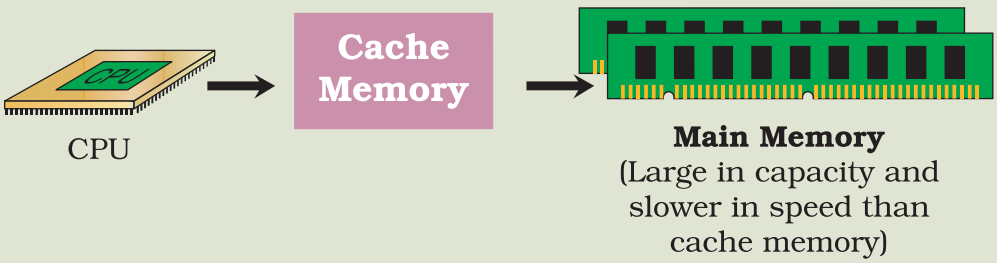


Figure 2.21 : Cache memory

Cache *is a collection of data duplicating original values stored elsewhere or computed earlier, where the original data is expensive to fetch (owing to longer access time) or to compute, compared to the cost of reading the cache. In other words, a cache is a temporary storage area where frequently accessed data can be stored for rapid access. Once the data is stored in the cache, future use can be made by accessing the cached copy rather than refetching or recomputing the original data, so that the average access time is reduced.*

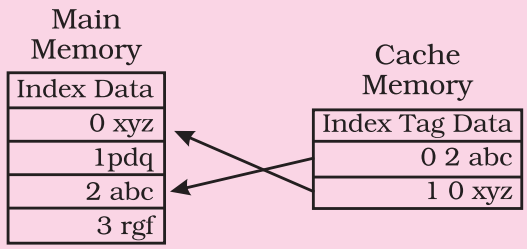


Figure : CPU memory cache

Primary Memory

It is a large memory which is fast but not as fast as an internal processor register. The processor directly accesses this memory. It is mainly based on integrated circuit.

The **primary memory** or the **main memory** is part of the main computer system. The processor or the CPU directly stores and retrieves information from it. This memory is accessed by the CPU, in a random fashion. That means any location of this memory can be accessed by the CPU to either read information from it, or store information in it. The primary memory itself is implemented by two types of memory technologies. The first is called ***Random Access Memory (RAM)*** and the other is read only memory (ROM). A more appropriate name for RAM is

RWM (read write memory), the CPU can write and read information from any primary memory location implemented using RAM. The other part of primary memory is implemented using ROM which stands for Read Only Memory.

There are two types of built-in memory, permanent and temporary, known as ROM and RAM, respectively, details of each given below:

Read Only Memory (ROM)

As we know, in the computer terminology, *read* means transferring data instruction from an input source to the computers, main memory (or CPU) and *write* is transferring data/instruction from computer's main memory to an output device. Therefore, read only means data/instruction can be retrieved from the ROM chip but cannot be modified.

Types of ROM

Basically, there are two types of ROM, namely, manufacturer programmed and user-programmed.

Manufacturer–Programmed Read Only Memory

Manufacturer-programmed ROM is one in which data is stored in it permanently by the manufacturer of the ROM. For example, a computer manufacturer may store the system boot program permanently in the ROM chip used on the motherboard.

User–Programmed Read Only Memory

User-programmed ROM is one in which the user can load and store "read-only" programs and data. Such a ROM is commonly known as **PROM** (programmable read-only memory), because, a user can program it. **PROM (programmable read-only memory)** is a memory chip on which we can store a program. But once the PROM has been used, we cannot wipe it clean and use it to store something else. Like ROMs, PROMs are non-volatile.

Other kinds of user-programmed ROM are EPROM and EEPROM. Both of these are special types of PROM. **EPROM (erasable programmable read-only memory)** can be erased by exposing it to ultraviolet light while **EEPROM (electrically erasable programmable read-only memory)** can be erased by exposing it to an electrical charge.

Flash EEPROM memory works much faster than traditional EEPROMs because instead of erasing one byte at a time, it erases a block or the entire chip, and then rewrites it. The electrons in the cells of a Flash-memory chip can be returned to normal ("1") by the application of an electric field, a higher-voltage charge.

Random Access Memory (RAM)

RAM chips are meant for primary storage. They hold temporarily (*a*) software/program instructions and (*b*) data before and after processing.

"Random Access" means that any location can be referenced in the same time and in the same manner, as it is independent of the address or location in the memory. It is a volatile memory. It holds data and instructions, during their execution. The additional RAM chip can be plugged into the special socket on the motherboard known as Single In-Line Memory Module (SIMM). Random Access Memory capacity ranges from 16 MB to 4 GB on personal computers.

Types of RAM

RAM chips are of two types, namely, *static* RAM (SRAM) and *dynamic* RAM (DRAM).

Static RAM (SRAM)

The SRAM can store data as long as power is applied, without the need for periodically rewriting the data into memory. Contents (memory cell) of this RAM will stay in a given state (store a bit) indefinitely, provided that power to the memory circuit is not interrupted. The main applications of SRAM are in areas where only small amounts of memory are needed or where high speed is required.

Advantage

SRAM can provide very high speed.

Disadvantage

SRAM is costly and has low power packing density.

Dynamic RAM (DRAM)

This memory stores data as charges on capacitors. With Dynamic RAM, the stored data will gradually disappear because of capacitor discharge, so that it is necessary to periodically refresh the data (i.e. recharge the capacitors). In the process of refreshing, the information is read from the memory cell and written back in the same position. Typically, each memory cell of a DRAM must be refreshed at least every 2 to 10 millisecond or its data will be lost.

Advantage

It has high capacity and power consumption is low.

Disadvantage

The need for refreshing of dynamic RAM because some external refreshing circuits is required.

Complementary Metal Oxide Semiconductor Memory (CMOS)

Besides RAM and ROM there is a third type of primary memory or storage called as CMOS. It is used to store the system configuration, date, time and other important data. When a computer is switched on, BIOS matches the information of CMOS with the peripheral devices and displays error in case there is any mismatch.

Table 2.4 : Comparison between ROM and RAM

ROM	RAM
Read Only Memory	Random Access Memory
It stores information permanently.	It holds information temporarily.
Information is not lost even if the computer is switched off.	Information is lost when power supply is switched off.
Known as non-volatile memory.	Known as volatile memory.
Holds system software such as Boot Loader.	Holds operating system and application programs which are currently in use.
Types of ROMs are PROM, EPROM EEPROM.	Types of RAMs are Dynamic RAM and Static RAM.

Secondary or Auxiliary Memory

Auxiliary memory is much larger in size than main memory but is slower than the latter. It normally stores system programs and data files. These cannot be accessed directly by the processor.

Secondary or auxiliary memory, also known as secondary storage, is the memory that supplements the main storage. This is a long-term, non-volatile memory. The term non-volatile means it stores and retains the programs and data even after the computer is switched off. Unlike RAM which looses the contents when the computer is turned off and ROM to which it is not possible to add anything new, auxiliary storage device allows a computer to record information semi-permanently. This is to ensure that this information can be read later by the same computer or by another computer. Auxiliary storage devices are also useful in transferring data or programs from one computer to another. They also function as backup devices which allows backup of the valuable information that we are working on. So, even if by some accident our computer crashes and the data in it is in unrecoverable mode, we can restore it from your backups. The most common types of auxiliary storage devices are floppy disks, hard disks, magnetic tapes and magnetic disks.

Sequential and Random Auxiliary Storage Devices

Based on the type of data access, sequential and random, auxiliary storage devices can be classified as sequential access media and random media.

In case of sequential access media, data stored in media can only be read in sequence. To get to a particular point on media, we have to go through all the preceding points. Magnetic tapes are examples of sequential access media.

In contrast, disks are random access media, also called direct access media, because a disk drive can access any point at random without passing through intervening points. Other examples of direct access media are magnetic disks, optical disks, etc.

Floppy Disk

Floppy disk (often called floppies or diskettes) is a soft magnetic disk. It is called floppy because it flops if we wave it (atleast the 5¼ inch variety does). The data on the floppy disk is organised in terms of tracks and sectors. Unlike most of the hard disks, floppy disks are portable because these can be removed from a disk drive. Disk drives for floppy disks are called floppy drives. Floppy disks are slower to access than hard disks and have less storage capacity but are less expensive and are portable.

There are two basic sizes of a floppy, namely 5¼ inch and 3½ inch. **5¼ inch :** This is the common size floppy for PCs made before 1987. This type of floppy is generally capable of storing between l00K and 1.2MB of data. The most common sizes are 360K and 1.2MB.

3½ inch : Floppy (Figure 2.22) is something of a misnomer for these disks as they are encased in a rigid envelope. Despite their small size, these floppies have a large storage capacity than their cousins – from 400K to 1.4MB of data. The common sizes for PCs are 720K (double density) and 1.44MB (high density).

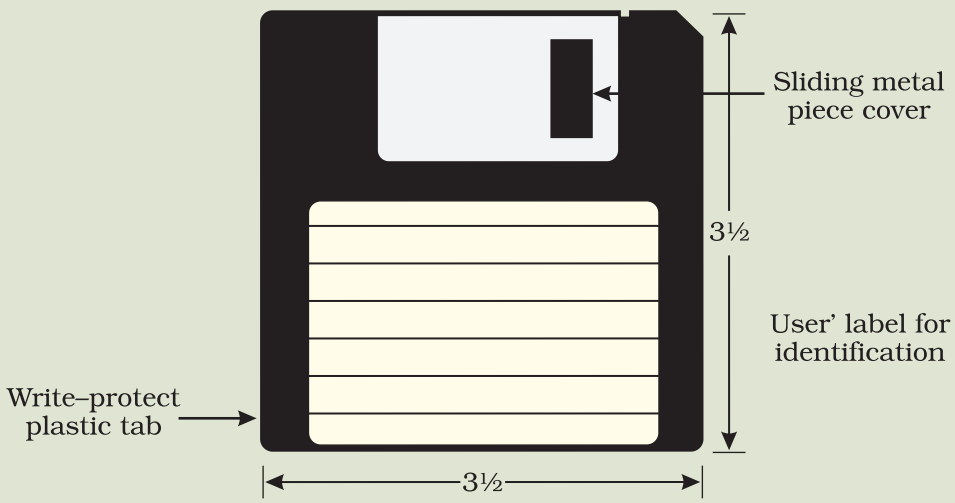


Figure 2.22 : Floppy

Optical Disk

An optical disc is an electronic data storage medium that can be written to and read using a low-powered laser beam. Optical disk can store much more data, i.e. upto 6 GB. There are three basic types of optical disks namely, CD–ROM, WORM and Erasable.

CD-ROM : Like audio CDs, CD-ROMs come with data already encoded

onto them. The data is permanent and can be read any number of times but CD-ROMs cannot be modified (Figure 2.23).

WORM : This term stands for "Write Once, Read Many" with a WORM disk drive. One can write data only once onto a WORM disk. After that, the disk behaves just like a CD-ROM.

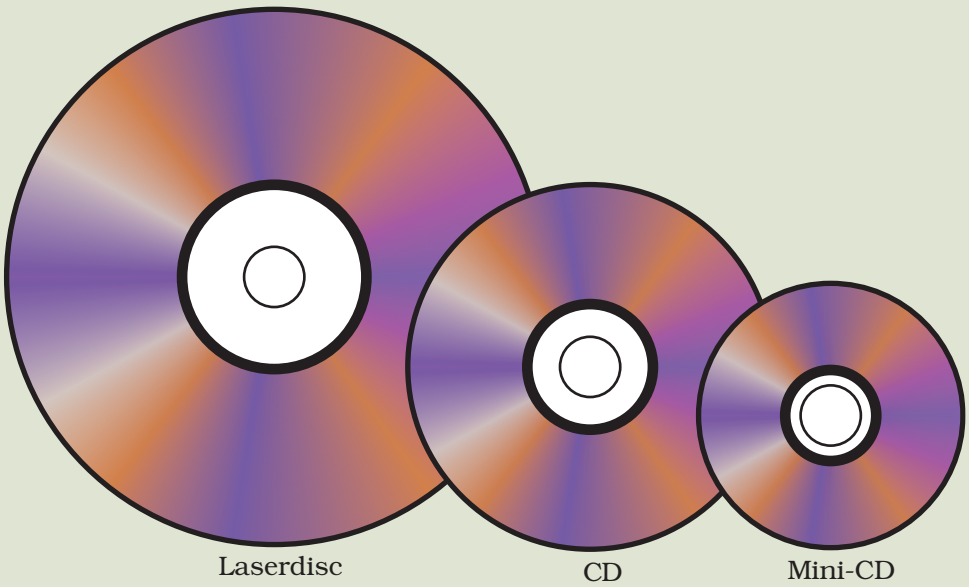


Figure 2.23 : Optical disks

Erasable : Optical disks that can be erased and loaded with new data are just like magnetic disks. These are often referred to as EO (Erasable Optical) disks.

Hard Disk

Hard disk is a magnetic disk (Figure 2.24) on which computer data can be stored. Hard disks hold more data and are faster than floppy disks. A single hard disk usually consists of several platters. Each platter requires two read/write heads, one for each side. All the read/write heads are attached to a single access arm so that they cannot move independently. Each platter has the same number of tracks. A track location that cuts across all platters is called a cylinder. For example, a typical 84 MB hard disk for a PC might have two platters (four sides) and 1,053 cylinders.



Figure 2.24 : Hard disk

Magnetic Tape

Magnetic tape (Figure 2.25) is a magnetically coated strip of plastic on which data can be

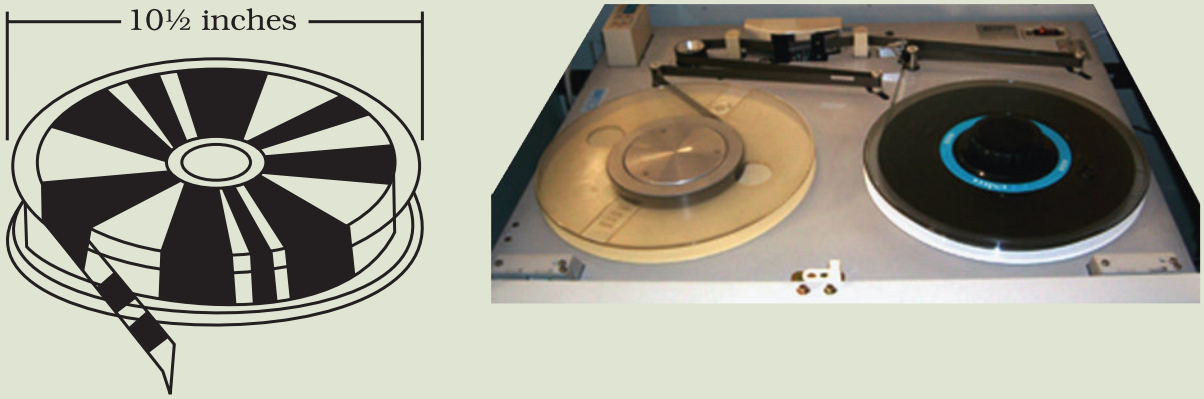


Figure 2.25 : Magnetic tape

encoded. Tapes for computers are similar to the tapes used to store music. Some personal computers, in fact, enable one to use normal cassette tapes. Tapes are considerably cheaper than storing data on disks but accessing data from tapes is much slower than accessing data from disks. Tapes also have large storage capacities, ranging from a few hundred KB to several GB. These are generally used only for long-term storage and backup.

Table 2.5 : Primary Storage vs. Secondary Storage

Primary Storage	Secondary Storage
It is the main memory as part of the CPU.	It is auxiliary memory which works under the control of CPU.
It is most expensive.	Relatively less expensive than primary memory.
Storage capacity is generally in MB or GB.	Storage Capacity is in GB and TB.
Retrieval and processing is very fast.	Retrieval and processing is comparatively slower.
Based on semi conductor technology.	Based on magnetic or optical technology.

2.2.3 Central Processing Unit

The central processing unit is one of the two most important components of the microcomputer. It is the electronic brain of the computer. In addition to processing data, it controls the functions of all the other components.

The Central Processing Unit (CPU) or the "Central Processor" carries out a variety of essential data manipulation (including arithmetic/ logical calculations, comparisons, sorting, etc.) and controlling tasks in the computer. CPU consists of Arithmetic Logic Unit (ALU) and Control Unit (CU).

Memory Unit Table	
1 Bit (Binary digit)	0 or 1
1 Byte	8 Bits
1 Kilo Byte (KB)	2^{10} Byte or 1024 Byte
1 Mega Byte (MB)	1024 Kilo Byte
1 Giga Byte (GB)	1024 Mega Byte
1 Tera Byte (TB)	1024 Giga Byte
1 Peta Byte (PB)	1024 Tera Byte

Every microprocessor contains a system clock. The speed at which the processor executes instructions is known as ***Clock Speed*** and it is measured in Megahertz (MHz).

Megahertz (MHz): a measure of frequency equivalent to 1 million cycles per second.

Gigahertz (GHz): a billion cycles per second.

Where *mega* means millions and Hertz means cycles. Therefore 550 MHz processor performs 550 million cycles per second. Generally, clock speed determines the system performance. Technology advances for higher clock speed. The latest generation of processors operates in *gigahertz* (GHz) *i.e.* a billion cycles per second.

Arithmetic Logic Unit

The Arithmetic Logic Unit carries out as the name suggests Arithmetic and Logical operations on the data made available to it. Basic Arithmetic functions which an ALU can carry out are addition and subtraction. More powerful ***CPUs*** can support additional mathematical operations like multiplication and division. The logical operation which it can carry out are greater than, equal to, less than and comparison between two numbers. Besides these operations some processors also support operations which check if particular bits are on or off.

A computer performs its operation in a fraction of a second. The increasing speeds given below are:

Millisecond = 10^{-3} second

Microsecond = 10^{-6} second

Nanosecond = 10^{-9} second

Picosecond = 10^{-12} second

Control Unit

The Control Unit can be thought of as the brain of the CPU itself. It controls the computer based on the instructions it decodes, how other parts of the CPU and in turn, the rest of the computer systems should work in order that the instruction gets executed in a correct manner.

Register

The register is a special, high-speed storage area within the CPU. All data must be represented in a register before it can be processed. For example, if two numbers are to be multiplied, both numbers must be in registers, and the result is also placed in a register. (The register can contain the address of a memory location where data is stored rather than the actual data itself.)

2.2.4 Output Device

The output devices of the computer are used to display results in electronic or paper medium.

Common output devices which produce output that is easily understood are Printers and Monitors.

The results generated by the output devices may be of two types:

Hardcopy Output : Such outputs are non-electronic version/permanent, and thus may be used at later date as and when they are required. They are usually on paper and are generally used to produce reports. The devices which are used to produce hardcopy output are printers, graph plotters, computer output microfilm, etc.

Softcopy Output : Such outputs are electronic, thus they are available either on screen or may be stored digitally on some storage device. The softcopy may be directly seen on screen or may be stored on hard disk/ CD/ DVD for further use.

Other output devices used for specific purposes are Projector, Sound card, Speakers and Video card.

Printers

A printer is an output device that prints characters, images and symbols on paper. On the basis of the printing technique used, printers may be classified as **impact** or **non-impact printers**.

Impact printers are like typewriters, as they use some sort of striking/ hammering action to press carbon or fabric ribbon against paper to create a character or a pattern. These devices are noisy and are not capable of producing high resolution graphics. The most common impact printers are **character** printers (e.g. daisy wheel, dot matrix) and **line printers** (e.g. chain printers, drum printers). Among impact printers,

line printers print one line at a time, so, these printers are extremely fast. Impact printers are ideal to be used for carbon copies.

Dot-matrix Printers

The print head of Dot-matrix printers (Figure 2.26) uses small pins, which strike on the paper to create a character or image. They are more economical than most of other types of printers, with lowest running cost. These printers are not used much now-a-days. However, at places where invoices and delivery notes are produced with a copy and the quality is not important, these are still used.



Figure 2.26 : Dot-Matrix Printer

Advantages

- The main advantage of dot-matrix printers now is the ability to produce carbon copies. They provide a cheap, reliable method of getting multiple copies of a printout.
- The other advantage is the low cost of printouts. It has low maintenance and running costs.

Disadvantages

- Dot-matrix printers are noisy, slow and produce a lower quality output.

Non-impact printers overcome the limitations of impact printers. They form characters or images without making print heads strike the paper. They use thermal, electrostatic, chemical or inkjet technology to produce printed output. They are fast and quiet in operation. The most common non-impact printers are **inkjet printers** and **laser printers**. These printers can come in two categories, one produces output with only one colour (i.e. black colour) and the other one produces output in multicolour.

Day–by–day, with advancement in the field of printing technology, the quality and speed of these printers are going up and prices are coming down. Colour printers are increasingly being used in homes and offices alike.

Inkjet Printers

Inkjet printers (Figure 2.27) use liquid ink technology. These printers are available in comparatively lower prices and are capable of producing reasonably good quality prints. The running cost of these printers is very high and so are not preferred by those seeking large volumes of prints. These printers are relatively noiseless during printing operation.

Advantages

- Inkjet printers are relatively inexpensive to buy, especially if colour is needed.



Figure 2.27 : Ink-Jet Printer

- Inkjet printers are also lighter in weight than other printers and some are small enough to be carried around in a portable carry case.

Disadvantages

- Inkjet printers are slower than laser printers.
- If left unused for long periods of time the cartridges can easily dry out.
- Colour cartridges are expensive in comparison.



Figure 2.28 : Laser Printer

Laser Printers (Non–Impact Printer)

Laser printers produce high quality paper prints at a high speed (with an average speed as 6 to 12 pages per minute). They are almost noiseless and use dry magnetic ink technology.

Advantages

- Laser printers are noiseless, high speed and high quality printers.
- Laser printers are comparatively economic for large number of printouts.



Figure 2.29 : Flatbed Plotter

Disadvantage

- Initial costs of laser printers are comparatively high.
- Size of laser printers is comparatively bigger.
- Repair cost and cartridges of these printers are generally expensive.



Figure 2.30 : Roller Plotter

Plotter

A plotter (also known as a graph plotter) is an output device, which produces high quality diagrams on paper. Colour pens are used to draw lines on the paper which is placed in the plotter. Some plotters have a flat area (plotter base) to put the paper on. These are known as flatbed plotters (Figure 2.29). There is another type of plotters, the roller plotter which uses a large roll of paper mounted on a roller (Figure 2.30). Usually a plotter is capable of producing prints on very large size paper sheets but have a speed slower than printers. Graph plotters are used for drawing building plans, graphs and three-dimensional drawings. They are often used by architects and engineers designing machines, bridges, etc.

Table 2.6 : Comparison between Impact printers and Non-Impact printers

Impact Printers	Non-Impact Printers
Work like typewriter and use striking/ hammering action.	They use thermal, electrostatic chemical and inkjet technologies.
Print in black or single colour.	Produce single colour/multicolour output.
Are noisy.	Almost noiseless.
High resolution graphics cannot be produced.	High resolution graphics can be produced.
Examples: Dot Matrix Printer, Character Printer and Line Printer.	Examples: Inkjet, Laser Printer, Plotters, etc.

Control Devices (Lights, Buzzers, Robotic Arms, Motors)

Many other devices may be connected to the computer to produce output. For example, lights may be connected to a computer which will respond to electrical signals that tell them to switch on and off. Buzzers may also be used for sound as the computer sends an electrical signal to switch them on and off.

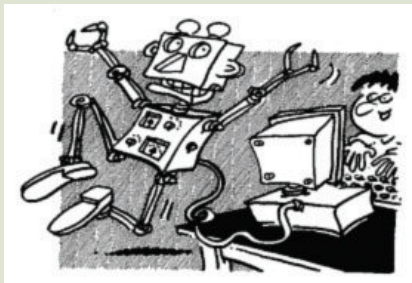


Figure 2.31 : Control Devices (Robots)

Also, a computer can control all sorts of devices which are operated by motors. Robotic arms are an example of a device which has its movements controlled by the computer. When an output device moves something it is called an *actuator*.

Control devices like traffic lights, buzzers and motors are used when the computer is controlling a situation such as regulating traffic lights or assembling cars.

Softcopy Output : Display Devices

Terminals

Terminal is a display device that may be used for entering data online from a remote location and for retrieving data. Depending upon the processing capability, terminals may be classified as **intelligent** or **dumb** terminals.

Intelligent Terminal refers to a terminal with its own memory processor and a firmware that can perform certain functions independently. They are usually personal computers, having their own local data processing capability, data storage and input/ouput capability. For a PC to be a terminal, a communication adapter (may be a modem) is essential. If terminals are communicating to one or several hosts and peers, then a

network program is also needed. There are two types of intelligent terminals, namely, **General purpose** and **Job-oriented**. The PC is an example of General Purpose Terminal. Typical General Purpose application of terminal is the Internet connection. This is the most pervasive terminal application and comes with modem and browser software. Job-oriented terminals are designed and developed for specific tasks. Typical job-oriented application of terminal includes airline reservation system terminal, a fast forward terminal ATM and a terminal for monitoring of a hospital patient. In such terminals hardware and software are customised to fit the application.

Dumb terminals are meant to enter the data and to receive output from the main computer, as they cannot process data on their own. These terminals are connected to the main computer through a communication link.

Video Display System

Video Display System provides a visual link between the user and the computer. The videos subsystem of a PC consists of two main components:

(a) Monitor and
(b) Video adapter (also called video card or graphic adapter)



Figure 2.32 : Visual display unit - CRT

A monitor is a display device which can produce text and graphic as output. A monitor may use different display technologies like a Cathode Ray Tube (CRT) and Liquid Crystal Display (LCD). CRT contains a vacuum tube which is used for display on screen in a computer. LCD is a technology in which molecules of a liquid crystal line up in such a manner that it creates images on the screen by blocking or transmitting light on the screen.



Figure 2.33 : Visual display unit - LCD

Audio Response Unit

As a voice recognition system allows the user to talk to a computer, a voice response system permits a computer to talk back to the user. Many organisations use audio-response systems to respond to human inquiries that are transmitted over telephone lines to the central computer.

Voice output is useful for people who are partially sighted. The computer can read word processed documents and communicate by sound output from the computer. Voice output is also useful for those who are physically handicapped and cannot speak. By typing on a keyboard they are able to communicate using the spoken word. Directory enquiries at Telecom Services use voice output to tell the caller the number that the computer system has found. Voice output is also used in multimedia presentations and provides a valuable means of communication.

Advantages

- The user cannot see the result on the computer screen, but can know the result even when they are located far away from it, or when they are visually handicapped.

Disadvantages

- The quality of voice output is getting better but it still sounds like a set of small sounds strung together and is therefore obviously electronic and rather unnatural.
- Sound files used for voice output occupy a large amount of memory.

2.2.5 Computer Ports

The input/output device is a piece of hardware that can be used for both providing data to a computer and for receiving information from it. But how does the computer communicate with these external devices? There are input/output interfaces called ports (Figure 2.34).

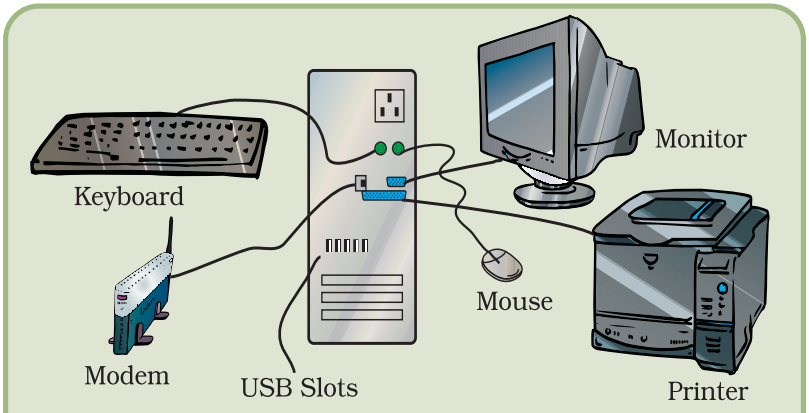


Figure 2.34 : Computer system showing verious ports

A computer ***port*** is a connecting socket, outside the system into which different types of cables are plugged. I/O ports are the interfaces through which computers communicate with external devices such as printers, modems, joysticks and terminals. Physically, they are distinguished by their external shape, numbers and shape of contact pins/points. Different interfaces and ports have different communication speeds and bandwidths to carry data to and from the CPU. Some such commonly used ports are explained below.

Parallel Port : A parallel port transmits 8 bits of a byte of data in parallel as it contains eight or more data lines for control of I/O devices. It is commonly used to connect the printer to a computer. It is used for transmitting fast data over short distances because interference among multiple signals limits the cable to relatively short distances.

Serial Port : A serial port transmits one bit of a byte at a time as a single stream of bits. It is meant for transmitting slow data over long distances. Communication over a phone system is an example of serial communication. A serial port connects a variety of devices such as modems, scanners, barcode readers and device control circuits.

PS/2 Port : It is one of the serial port connectors used to plug mouse and keyboards into a personal computer. It consists of six pins in a small and round shaped socket.

Universal Serial Bus (USB) Port : USB port is the most popular port used to connect up to 127 peripheral devices such as digital camera, speaker, scanner, printer, plotter, modem, joystick, pen drive, etc. USB permits Plug and Play – i.e. it allows us to install device drivers as and when the devices are plugged on.

Small Computer System Interface (SCSI) Port : SCSI port allows data transmission in a "daisy chain" to up to 7 devices at a speed (32 bits at a time) much higher than serial and parallel ports. The devices that may be connected to SCSI ports are hard-disk drives, CD-ROM drives, scanners, backup units, network adapters etc. In daisy chain several devices are connected in series. If data has to reach the seventh device then it needs to go through, all the six devices first.

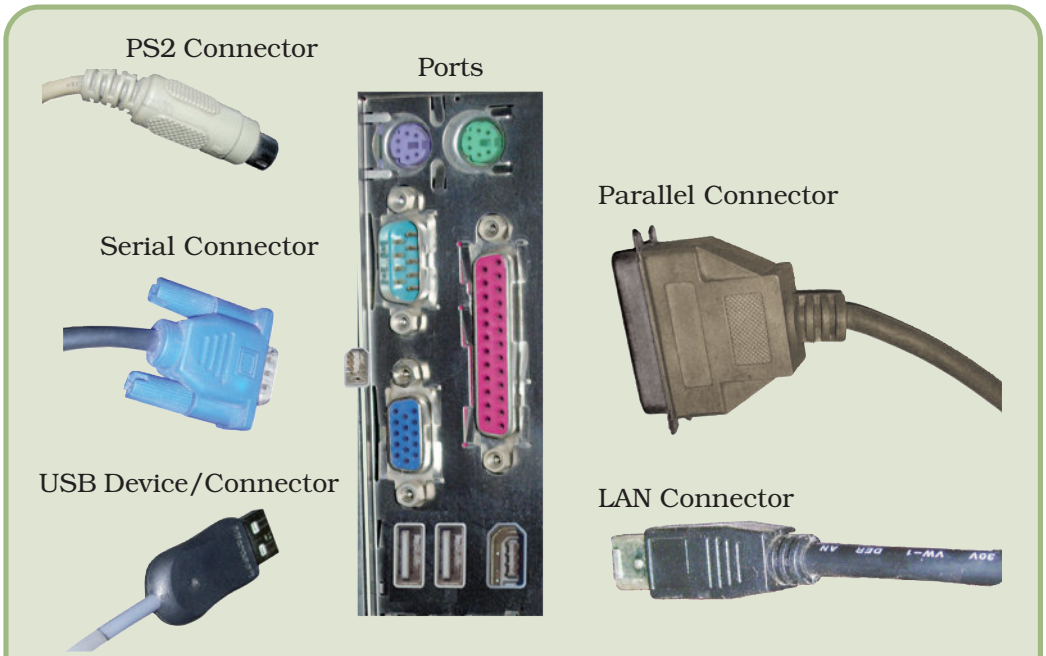


Figure 2.35 : Different types of ports

Fire Wire (IEEE 1394) Port : Fire Wire port is a relatively a new technology for high speed data communication. The need of this arose due to large audio and video data movement from multimedia devices. The devices connected via Fire Wire Port are Video Camera, External Hard Disk Drives, External CD/DVD Drives. Microsoft has developed device drivers to support IEEE1394 in all the versions after Windows 95. Linux also supports this port. It is extremely fast with Data Transfer Rate up to 400 Mb/sec.

2.2.6 Computer Equipment Maintenance

Computer maintenance entails a four-fold attack against deterioration of hardware, security threats, software bugs and performance degradation. Each can seem overwhelming or insignificant but,

considering the importance of computer systems operations, the cost and time are trivial compared to the hassle of getting a system up and running after a crash.

In fact, we should upgrade the computer every three years or so, but we will have to transfer all the data and software from the original computer, whereas a hard-drive swap is a transparent upgrade.

Preventive Maintenance

It is important to maintain computer equipment and consumables. Routine or preventive maintenance ensures that the computer equipment will remain in good working order. Examples of preventive maintenance of computer equipment are the cleaning of the keyboard, monitor and mouse. There are a few important DOs and DON'Ts which, if adhered to, can save a lot of maintenance and repair cost. This is known as preventtive maintenance. The basic preventive maintenance features are given in Appendix 2.1.

2.3 COMMUNICATION TECHNOLOGY

Letters and telegrams have been the modes of communication for a very long time. They require setting up of post offices in various regions and then a hierarchical level of post officers and transport systems to carry the mails. Such a huge infrastructure is required for the mail delivery system. This was a sort of manual technology for mail delivery.

Then telephones were made more accessible to the common man. Communication through letters reduced considerably. The e-mail has simply revolutionised our lives, conquered time and space and communication is instantaneous and cheap.The scope of message that could be communicated through e-mail in comparison to postal or telephone mode is mind boggling.

The e-mail enables one to send message content of any size consisting of video, photographs, graphics, and audio. One can even keep track of sent messages and received messages. Another communication technology is *chat* where two persons can communicate by sending instant messages to each other; they can even see each other using web cameras. E-mail and chat technology are based on the Internet. This technology provides all options under one roof with security provisions.

Communication is essentially exchange of information and information by its own right has evolved as an independent technology. With the kind of information explosion that has happened globally and the logical thirst for knowledge, computers have an eminent role to play in view of their capacity to generate and store information as well as their essentiality in the broadband technology on which the Internet works.

2.3.1 Computer Technology in Education

Computer technology promotes independence and self-assessment. It stimulates the interest of the students. The various programs in the system help students in self-assessment. ***Word processor*** programs help students in organising their written work letter. Interactive computers also help students with their pronunciation. Computer technology assists people in learning languages. Teachers may evaluate their teaching methods with the help of computers. They may also effectively use computer technology to enhance their teaching skills. Computer technology assists people with learning disabilities. The physically challenged may use graphics software and word processor to express themselves. Computer technologies also benefit people with speech disability by replaying film clips of their speeches and helping in practising their speech skills.

2.4 SOFTWARE

A computer is a programmable device. A program is a stepwise organisation of the different steps in which an event happens. When these steps are predetermined and incorporated in a device we have actually programmed the device to perform the job. Our human brain also functions as a programmed device. But it is uniquely endowed with the power of altering a program with which it initially started if the situation demands. It is in this that the computer is different from the human brain. The computer does not have its own intelligence. It can as an obedient servant, execute instructions. But it has tremendous potential to execute them with an accuracy and speed far exceeding the domain human physical capabilities.Hence with increasing requirements, the human brain has worked out complex programs to make best use of the capabilities of a computer, at the same time overcoming its limitations.

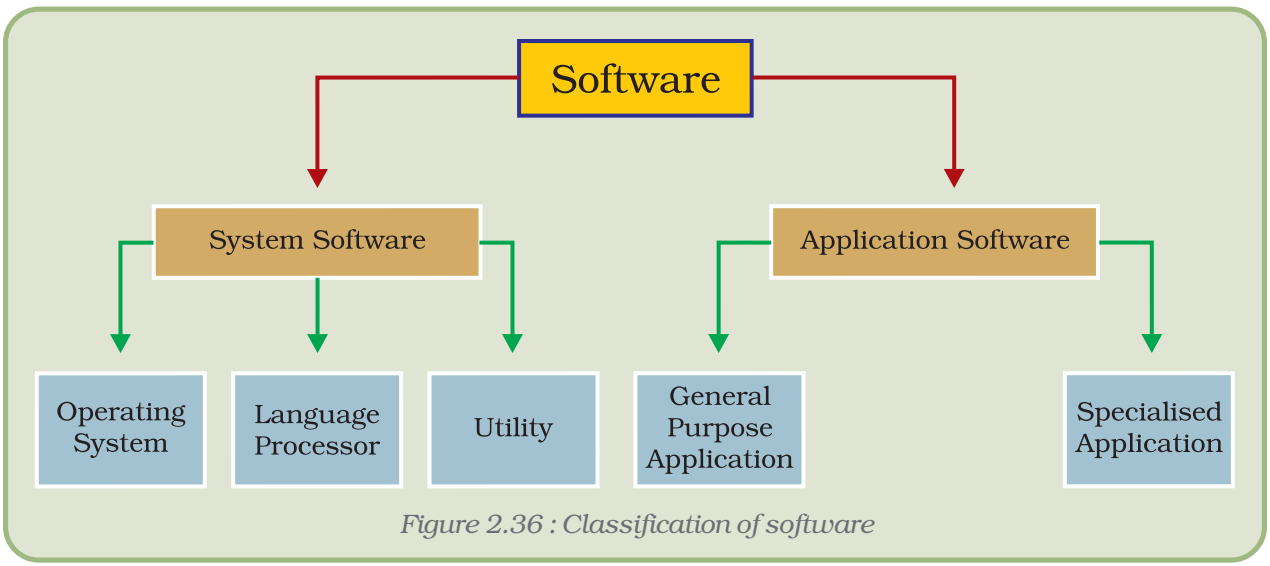


Figure 2.36 : Classification of software

Software is usually divided into two major categories:

System software

Application software.

2.4.1 System Software

System software is a set of one or more programs, which are designed to control the operation and networking of computers. It acts as an intermediary between computer hardware and application program. It can further be divided into three types: Operating System, Language Processing and Utilities.

Operating System : An operating system is a set of instructions that manages overall performance and functioning of the computer system by controlling the resources such as CPU, memory, I/O devices and overall flow of information within the system. It acts as an interface between the machine and its users. Some examples are Linux, MS/PC-DOS, Mac OS, Windows 95/98/NT/ME/ Millienium/VISTA.

Language Processors : For program execution, instructions must be converted into the machine language. Language processors are used to convert assembly language and high-level language programs into machine level language. Examples: assemblers, translators and compilers.

Utilities : These are designed to aid, manage and tune the computer hardware, operating system or application software. These are also known as service programs, service routines, tools, or utility routines. Examples: disk defragmenter, disk compression, disk cleanup, disk checkup etc.

2.4.2 Application Software

Application software is a set of one or more programs designed to do a specific task such as processing of student admission examination result, pay calculation, payroll, general accounting, inventory control. Different organisations need different application programs. The special purpose programs are also known as ***"packages".***

A computer system comprises not only of hardware or software but of both. Hardware is generally controlled by the software. Software is a set of instructions called a **program**. British sp.–programme. Computer related spelt as program. In general, the word program means a sequence of steps, like come home, wash hands, have a cup of tea or lunch and like this we prepare a list of activities that we are going to do throughout the day. Similarly while designing a software, instructions need to be written in a proper sequence.

Software can also be classified as given below:

2.4.3 Shareware

Shareware software is copyrighted software that is distributed on a 'try before we buy' basis by paying a nominal shareware fee. Users who want to continue using the program after the trial period are encouraged to send a payment for the program to the program developer. Shareware is generally less expensive because often a single programmer develops it.

2.4.4 Freeware

Freeware programs are programs that are given away free of charge and often made available on the Internet. The programmer offers programs as freeware either for personal satisfaction or to assess its reception among interested users. Program developers often retain all rights to their freeware and users are not free to copy or distribute or sell it further.

Open Source

"**Open source** describes the principles and methodologies to promote open access to the **production** and **design** process for various goods, products, resources and technical conclusions or advice. The term is most commonly applied to the source code of software that is made available to the general public with either relaxed or non-existent intellectual property restrictions. This allows users to create user-generated software content through either incremental individual effort, or collaboration."

OSS – Advantages

Better for Coders – Open source software development is quite different from conventional closed source software development. People start coding from the point of already existing level of code. They are not required to waste their time and energy to research on something, which has already been done by someone else.

Better for Users – The user does not have to get into huge budgetary issue for using applications. The user can get his applications customised without getting into huge investments.

Faster development – The applications are developed very fast by taking references from OSS developers working worldwide.

Future of Open Source – So where does it all end? How exactly will open source shape our lives leading us to a better tomorrow? It is for certain that with this level of growth and progress, we expect to see open source as the driving force of the software industry in the next few years.

Greater Freedom – OSS finds developers in users. Following the movement which has started and following the guidelines they had set for building OSS, it will continue its excellence in building better and better stuff for everyone.

Open Standards – Also known as Open Formats, Open Standards are much more than just a published specification for storing digital content, media or data. It is a key to freedom.

Algorithm

When any job or task is written or described in a sequence of steps in plain English language, it is called an algorithm. It can contain simple words, which convey meaning, to do a task. For example, algorithm to add two numbers can be simply described in a few steps given below:

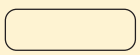
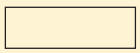
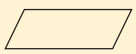
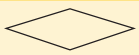
1. Start
2. Accept first number as A
3. Accept second number as B
4. Take a number C = A + B
5. Display C
6. End

As the computer is a machine and does not have a brain of its own we need to tell from where to begin and where to end. In the above example, use of 'Start' and 'End' is to indicate the beginning and end of the task.

Flowchart

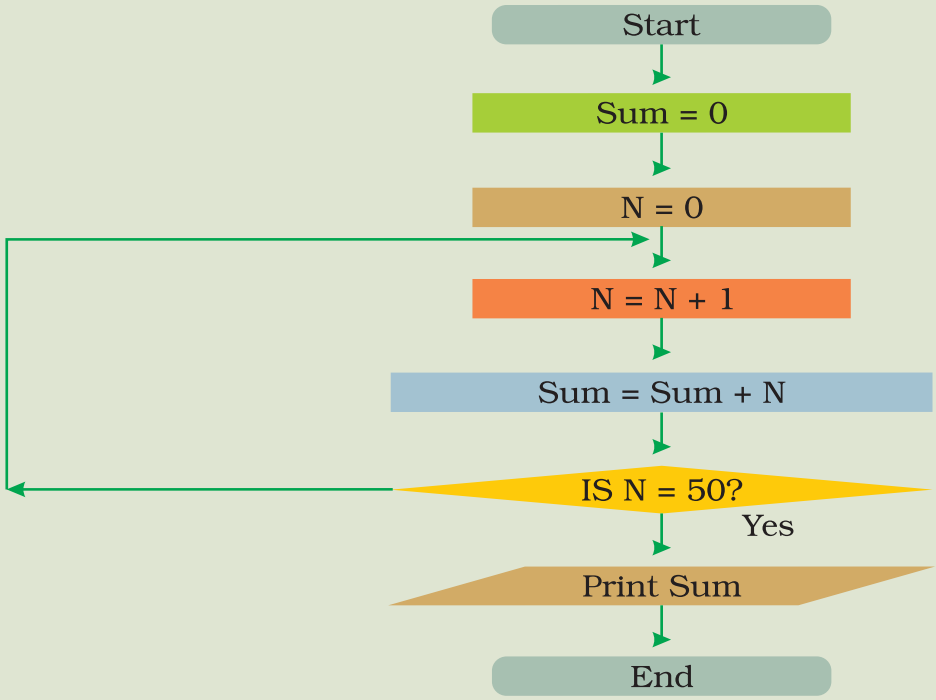
Pictorial representation of these steps is known as flowchart. A flowchart uses a particular set of symbols shown in Table 2.7. A flowchart can help to identify bottlenecks or any inefficiencies in the program.

Table 2.7 : Various symbols used in flowchart

	Start or end of the program
	Computational steps or processing function of a program
	Input or output operation
	Decision making and branching
	Connector or joining of two parts of program
	Magnetic Tape
	Magnetic Disk
	Off-page connector
	Flow line
	Annotation
	Display

Example of Flowchart

Draw a flowchart to find the sum of first 50 natural numbers.
Answer : The required flowchart is given below:



Algorithms and flowcharts are like road maps for accomplishing a given, well-defined task.

2.5 PROGRAMMING LANGUAGES

2.5.1 Machine Language (First Generation Computer Language)

After preparing an algorithm and a flowchart for a particular software it has to be written in the computer coded language. Unlike humans, computers can understand language of only 0s and1s (binary digits), i.e., binary number system (Number system is given in Appendix 2.2). A program written in 0s and 1s is called machine language program or binary language program. Machine language was the first generation (Figure 2.37) computer language.

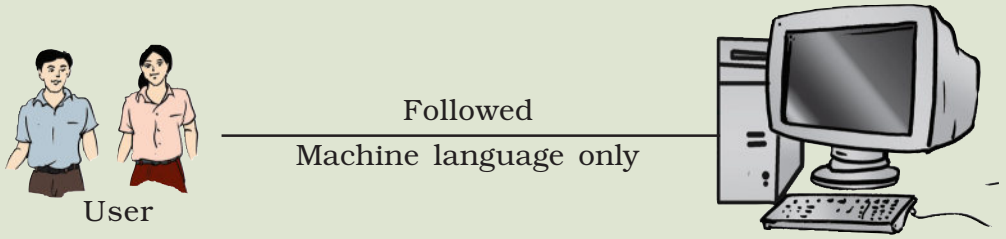


Figure 2.37 : First generation language

A sample code in machine language is shown below:

ADD 011814 is written as

00010000000000100111011000011100

Machine language is faster in executions since the computer directly starts executing it but at the same time it is very difficult to write and understand.

2.5.2 Assembly Language (Second Generation Language)

As it was very difficult to generate code in machine language, the assembly language was developed which consisted of small meaningful terms. This is considered to be the second generation language (Figure 2.38).

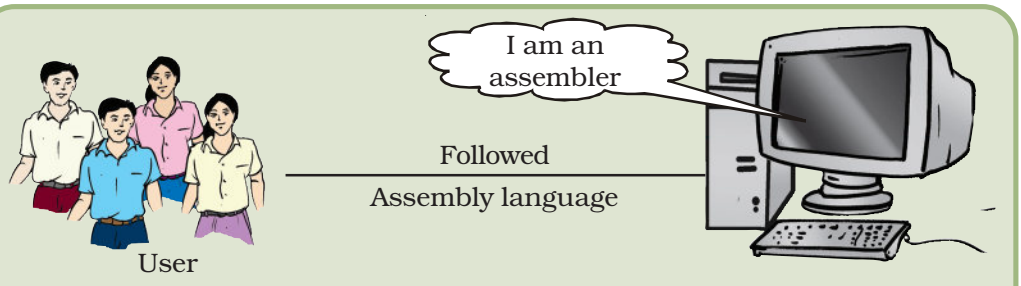


Figure 2.38 : Second generation language

An example of an assembly language program for adding two numbers X and Y and storing the result in some memory location:

LDA A	Load value of A in accumulator
ADA B	Add value of B in the value of accumulator
OUTA	Display the content of accumulator on output device

A machine cannot execute an assembly languages program directly as it is not in a binary form. An ***assembler*** is needed in order to translate an assembly language program into the **object code** executable by the machine.

This is illustrated in the figure 2.39:

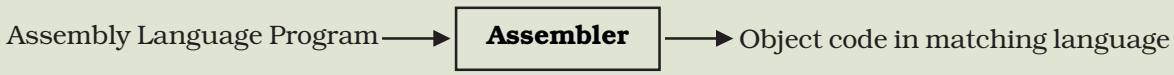


Figure 2.39 : An assembler

Writing a program in assembly language is more convenient than in machine language. It is more readable. But assembly language has some complications associated with it like:

- Assembly language is not portable. It means that assembly language program written for one processor will not work on a different processor.
- Assembly language program is not as fast as machine language because it has to be first translated into machine (binary) language code.

Machine language and assembly language are referred to as low level languages since the coding for a problem is at the individual instruction level.

2.5.3 High Level Language (Third Generation Language)

We have heard about programming languages like C, PASCAL, COBOL, FORTRAN and BASIC. These are called high level languages (**HLL)** or third generation languages (Figure 2.40). The program shown below is written in BASIC to obtain the sum of two numbers.

```
10    X=7
20    Y=10
30    PRINT X + Y
40    END (.)
```

The time and cost of creating machine and assembly languages was quite high and this was the prime motivation for the development of high level languages.

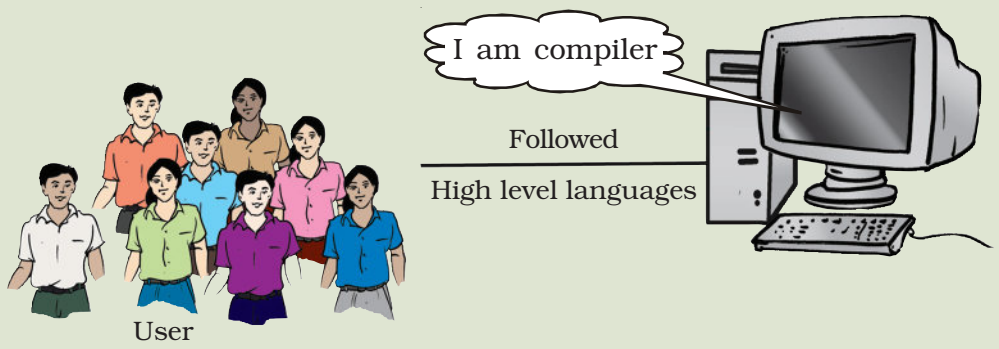


Figure 2.40 : Third generation language

A high level source program must be translated first into a form which the machine can understand; this is done by a software called ***Compiler*** (Figure 2.41).

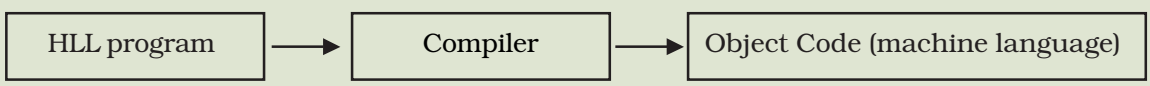


Figure 2.41 : A compiler

Advantages

- Readability
- Portability
- Easy Debugging
- Easy Software development

2.5.4 Fourth Generation Language

Most fourth generation languages (Figure 2.42) are non–procedural languages. The programmer does not have to give the details of procedure in the program, but instead, specify what is wanted.

Major fourth generation languages are used to get information from files and databases. They are query languages, which are used to answer queries or question with data from a database. For example:

SELECT Name, Address

FROM Personnel

WHERE Name = "Ekambaram Vasudevan";

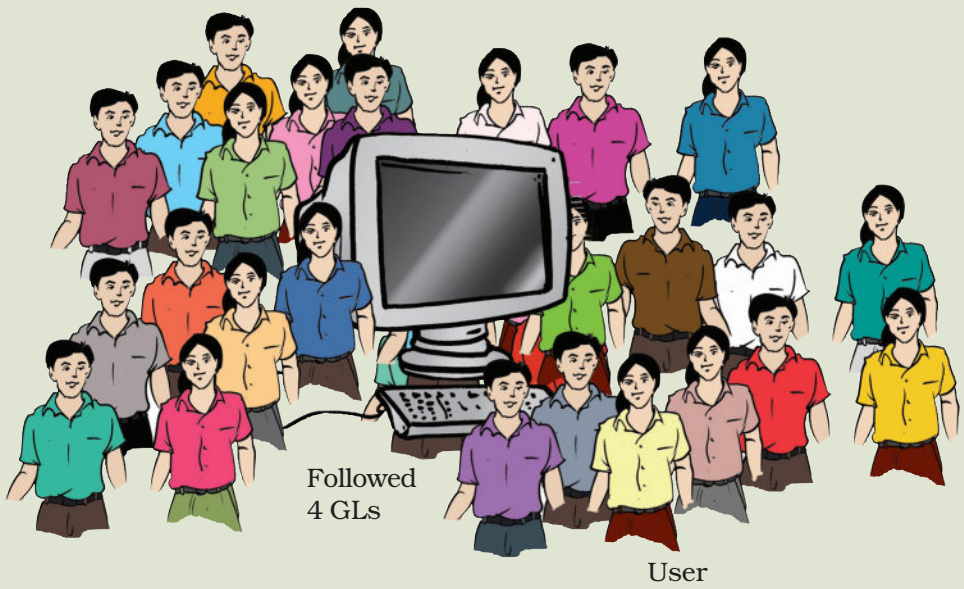


Figure 2.42 : Fourth generation language

2.5.5 Fifth Generation Language

Fifth generation programming languages will permit the user to give commands in a more conversational way. These will use voice input devices rather than traditional keyboards or pointing devices.

Fifth generation languages are used mainly in artificial intelligence research. Example of fifth generation languages: PROLOG, OPS5, and MERCURY are the best known fifth generation languages.

Summary

- A computer system is a combination of hardware and software used to perform a task more efficiently and accurately.
- Hardware is the set of all tangible and physical components.
- Software comprises of a set of instructions.
- An input device is used to feed instructions or data into the computer.
- An output device is used to show the results processed by the computer.
- Input/output can be in the form of text, graphics or sound.
- A port is a connecting socket which can be used to transfer data to and from the computer.
- A port can be a parallel port, or a serial port.
- CPU is the brain of the computer which processes all the information.
- A software can be either a system software or application software.
- System software handles the working of the system.
- Application software is useful for a particular application in daily life.
- Shareware is very inexpensive software.
- Freeware is a software which is free of cost.

EXERCISE

Short Answer Type Qustions

1. CPU is the brain of the computer. Comment.
2. Why is cache memory known as fastest memory?
3. What types of operations are performed by ALU?
4. What are the components of the storage unit of a computer system?
5. Define Input and Output devices.
6. Differentiate Shareware and Freeware.
7. What is Clock speed?
8. What is the relation between bit, byte, kilobyte, megabyte, gigabyte, terabyte and petabyte?
9. "A device can be used as input as well as output". Explain with an example.
10. What do you understand by the word Microprocessor?
11. "Human speech may be used as input and output" discuss. What hardware and software are required for it?
12. What do you mean by language processor? Give few examples of language processors.

13. Expand the following terms

(i)	ROM	(x)	VDU
(ii)	RAM	(xi)	CRT
(iii)	USB	(xii)	MDA
(iv)	SCSI	(xiii)	CGA
(v)	OMR	(xiv)	VGA
(vi)	MICR	(xv)	SVGA
(vii)	OCR	(xvi)	DPI
(viii)	EPOS	(xvii)	XGA
(ix)	MIDI	(xviii)	RAID

14. What do you understand by secondary storage? Why is there a need for secondary storage devices?

15. What is firmware? State the use of firmware.

Long Answer Type Questions

1. Draw a block diagram to illustrate the basic organisation of a computer system and explain the functions of various units.

2. What is the relation between a flowchart and an algorithm?

3. What is the role of a computer in communication?

4. What are various parts of a computer and how do they work?

5. Differentiate between the following:

   (a) System software and Application software.
   (b) Software and Firmware.
   (c) Firmware and Liveware.
   (d) Hardware and Software.
   (e) Primary memory and secondary memory

6. What is utility software? Where are they used?

7. What is an operating system? Describe its main functions.

8. List out some of the key functions performed by the system software of a computer system.

9. "The computer cannot perform anything on its own, thus any error in the output is not a technological error". Comment.

10. "Although the computer possess various advantages, it also has certain limitations" - Explain.

11. What are I/O devices? What is the significance of using such devices?

12. Differentiate between parallel port and serial port. Why are they necessary for the computer system?

13. What do you understand by 'interactive input devices'? Discuss a situation where they are appropriate for use.

14. What is the difference between locator and pointing devices? Describe their applications.

15. What is digitising tablet? Is it an input or output device? What kind of applications are associated with this device?

16. Identify the differences between vision-input system and image scanning system.

17. What are offline data entry devices? How are they different from online data entry devices?

18. Why do we require output devices? Describe the various forms of output.

19. A report needs to be generated for managers in an organisation, containing total sales over the year with a graph indicating the last 5 years' sale and prediction for the next year. What kind of output devices will be appropriate for this purpose and why?

20. Describe the utility of printers.

21. Write short notes on the following:
    (a) Scanner
    (b) MIDI
    (c) Intelligent Terminal
    (d) Ports
    (e) Non-Impact Printers

22. Distinguish between the following:
    (a) Laser Printer and Dot Matrix Printer
    (b) Dumb-terminal and Intelligent Terminal
    (c) Impact Printer and Non-Impact Printer
    (d) Optical Mark Reader and an Optical Character Reader.

Multiple Choice Questions

1. Which of the following language(s) has portability as its main feature?
    (i) Assembly language
    (ii) High level language
    (iii) Machine language
    (iv) 4GL

2. Debugging is the term for
    (i) compilation
    (ii) execution
    (iii) removing errors
    (iv) not reading comments

3. Hardware is –
    (i) Tangible equipment
    (ii) In-tangible equipment
    (iii) Set of instructions
    (iv) Operating system

4. Assembler converts –
    (i) Assembly language to Machine language
    (ii) Machine language to Assembly language
    (iii) Assembly language to High level language
    (iv) High language to Assembly language

Activities

1. Look at the computer in your school and observe the following:
   (a) What type of input devices and output devices are used?
   (b) To which type of port are they attached.
2. Ask your teacher to show you an inkjet print cartridge and laser toner cartridge. Why do you think ink-jet print cartridge dries out faster than laser toner cartridge?
3. Can you access the computer using a microphone to use word processing software.
4. Observe what kind of software/utilities you use on a computer.
5. Look at your own computer and note down its memory, speed, type. Also draw and label the main components of your computer. Observe the software used on your computer system.

APPENDICES

Appendix 2.1 : Preventive Maintenance of Computer Equipment

The basic preventive maintenance features are described below:

- Excessive dust buildup inside the computer can cause overheating, which degrades performance as well as accelerates wear and tear of the interior parts. If we are not already familiar with opening the computer to do a little dusting, hire a professional for a through cleaning job. The cost should be minimal, especially if we request it during the yearly hard-drive swap.
- The keyboard can be cleaned by turning it upside down and gently tapping the bottom of the keyboard.
- Monitors can be cleaned with a dry soft cotton cloth.
- Printers require routine maintenance as well. Clearing out paper jams, changing cartridges and cleaning the printer will lengthen the life of the printer. Most printers have a print head clearing function or we can use a print head cleaning kit. Make sure that you read the manufacturer's instructions before performing any maintenance.
- Consumables like floppy disks, CD, DVD and paper require correct storage to ensure that they will be usable when required. They should be stored in a clean and dry area.
- To ensure that the moisture content of the paper is kept at an optimum level, paper should be stored in a sealed container. Moist paper tends to curl and jam in the paper path of a printer.
- The case within which the motherboard, power supply, drivers, ect. are housed, has a number of vents that allow for a controlled airflow from the power supply and processor fan to keep the components at a satisfactory operating temperature.

Effect of Negligence to Computer Equipment

- **Loss of Money :** The loss of computer equipment caused by mechanical failure of hardware components is common. When losses occur, the cost of repairs is absorbed by the affected organisation's budget.
- **Waste of time and reputation :** Gross negligence results in physical damage, defacement, or destruction of computer equipment; theft; unauthorised access or use; unauthorised alteration, substitution, or deletion of programs, command files, data files, documentation, or other

material; wiretapping or any form of unauthorised signal interception; divulgence of confidential information or computer access methods to unauthorised persons.

- **Performance Degradation :** Computers often have too many temporary files cluttering the system, a fragmented file system, viruses/spyware/adware, and unnecessary programs running on startup. Windows XP has several software packages to help clean up systems, including Disk Cleanup, Disk Defragmenter and Check Disk. Each speeds up computers and is easily used by novices.

If the computer is still operating slower than expected, we should look into software packages to run deep checks of the entire system, inspecting its registry, missing shortcuts and Windows files. These programs can increase system performance by removing thousands of unneeded registry settings from uninstalled software, cleaning up unnecessary programs from startup, and removing the deluge of temporary files stored on everyone's computer.

Appendix 2.2 : Numbers System

Decimal Number System

Most people today use decimal representation to count. In the **decimal system** there are 10 digits:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9

These digits can represent any value, for example:

754.

The value is formed by the sum of each digit, multiplied by the **base** (in this case it is **10** because there are 10 digits in the decimal system) in power of digit position (counting from zero):

$$7 \cdot 10^{2} + 5 \cdot 10^{1} + 4 \cdot 10^{0} = 700 + 50 + 4 = 754$$

(10 : Base; 0 : Digit Position)

Position of each digit is very important! For example, if we place "7" at the end:

547

it will be another value:

$$5 \cdot 10^{2} + 4 \cdot 10^{1} + 7 \cdot 10^{0} = 500 + 40 + 7 = 547$$

(10 : Base; 0 : Digit Position)

Important note: Any number in power of zero is 1; even zero in power of zero is 1:

$10^{0} = 1$ $\quad$ $0^{0} = 1$ $\quad$ $X^{0} = 1$

Binary Number System

Most modern computer systems operate using binary logic. By convention we use the values zero and one. These two values, coincidentally, correspond to

the two digits used by the binary number system. Therefore, computers employ the binary system.

Similarly, in binary (Base–2), all the columns are powers of 2. Think of the following table as the four least significant digit place holders for the binary number system just like the tables above using the decimal number system:

Eight's column (Most significant digit)	Four's column	Two's column	One's column (Least significant digit)
2^3	2^2	2^1	2^0

The binary number 10100101b equals to decimal value of 165:

10100101b =
$= 1.2^7 + 0.2^6 + 1.2^5 + 0.2^4 + 0.2^3 + 1.2^2 + 0.2^1 + 1.2^0$
$= 128 + 0 + 32 + 0 + 0 + 4 + 0 + 1 = 165$

Base — Digit Position

For example, let's look at the binary number:

1011

and convert it to decimal number.

	Eight's	***Four's***	***Two's***	***One's***
	1×2^3	Plus 0×2^2	Plus 1×2^1	Plus 1×2^0
Which equals	1×8	Plus 0×4	Plus 1×2	Plus 1×1
Which equals	8 Plus 0	Plus 2	Plus 1	

The total is : 11 (in decimal), which equals 8 + 0 + 2 + 1.

In other words,

$1011_2 = 11_{10}$.

The subscripted number indicates the number base.

Example 1

What is the decimal equivalent of the binary number 0111 (also written as 0111_2) ?

Answer

0×2^3	Plus 1×2^2	Plus 1×2^1	Plus 1×2^0
$= 0 \times 8$	Plus 1×4	Plus 1×2	Plus 1×1
$= 0$	$+ 4$	$+ 2$	$+ 1$

Total = 7 (also written as 7_{10})

Example 2

What is the decimal equivalent of the binary number 1010 (also written as 1010_2) ?

Answer

1×2^3	Plus 0×2^2	Plus 1×2^1	Plus 0×2^0
$= 1 \times 8$	Plus 0×4	Plus 1×2	Plus 0×1
$= 8$	$+ 0$	$+ 2$	$+ 0$

Total = 10 (also written as 10_{10})

Different number systems are summarised in Table 2.8

Table 2.8 : Binary to decimal conversion

Binary Evaluate	24	23	22	21	20		Value	Decimal Number
Decimal Value	16	8	4	2	1			
					0	>	0	0
					1	>	1	1
			1	1	0	>	4+2+0	6
		1	0	1	0	>	8+0+2+0	10
	1	0	1	1	0	>	16+0+4+2+0	22
	1	1	0	0	1	>	1+8+0+0+1	25
	1	1	1	1	1	>	16+8+4+2+1	31

Decimal To Binary Conversion

To convert a decimal number to binary, first subtract the largest possible power of two, and keep subtracting the next largest possible power form the remainder, marking 1s in each column where this is possible and 0s where it is not.

Example 3 (Convert decimal 44 to binary)

44
−32
12
−8
4
−4
0

32	16	8	4	2	1
1	0	1	1	0	0

Example 4 (Convert decimal 15 to binary)

15
−8
7
−4
3
−2
1

32	16	8	4	2	1
0	0	1	1	1	1

Binary Arithmetic

Rules of Binary Addition

- 0 + 0 = 0
- 0 + 1 = 1
- 1 + 0 = 1
- 1 + 1 = 0 and carry 1 to the next more significant bit.

Example 5

11+11=11	1		Carry
0	1 1	=	3 (base 10)
	+ 1 1	=	3 (base 10)
	1 1 0	=	6 (base 10)

Rules of Binary Subtraction

- 0 – 0 = 0
- 0 – 1 = 1 and borrow 1 from the next more significant bit
- 1 – 0 = 1
- 1 – 1 = 0

Example 6

00100101 – 00010001 =	0		Borrows
00010100	0 0 1 0 0 1 0 1	=	37 (base 10)
	– 0 0 0 1 0 0 0 1	=	17 (base 10)
	0 0 0 1 0 1 0 0	=	20 (base 10)

Rules of Binary Multiplication

- 0 x 0 = 0
- 0 x 1 = 0
- 1 x 0 = 0
- 1 x 1 = 1 and no carry or borrow bits.

Example 7

00100101 × 00010001 =	0 0 1 0 1 0 0 1	=	41 (base 10)
11110110	× 0 0 0 0 0 1 1 0	=	6 (base 10)
	0 0 0 0 0 0 0 0	=	17 (base 10)
	0 0 1 0 1 0 0 1		
	0 0 1 0 1 0 0 1		
	0 0 1 1 1 1 0 1 1 0	=	246 (base 10)

Binary Division

It is a repeated process of subtraction (as in decimal division).

Example 8

00101010 ÷ 00000110 =	1 1 1	=	7 (base 10)
00000111	1 1 0) 0 0 ⁺ ²0 1 0 1 0	=	42 (base 10)
	– 1 1 0	=	6 (base 10)
	1		borrows
	1 0 ²0 1		
	– 1 1 0		
	1 1 0		
	– 1 1 0		
	0		

There are other number systems also. Table 2.9 gives a comparison between different Number Systems.

Table 2.9 : Comparison of various number systems

Number system	*Base value*	*Symbolic character set*
Binary	2	0,1
Octal	8	0, 1, 2, 3, 4, 5, 6, 7
Decimal	10	0, 1, 2, 3, 4,5, 6, 7, 8, 9
Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

Word Processing Tool 3

Objectives

After completing this Chapter, the student will be able to:

- *work with any word processing program,*
- *create, save and open a document using a word processor,*
- *format a document inserting bullets/numbering, tables, pictures, etc.,*
- *set custom tabs and apply styles,*
- *prepare a document for printing,*
- *enhance the features of the document inserting graphics, tables, pictures, charts, etc., and using different formatting styles,*
- *modify document using various editing and formatting features within or across documents,*
- *produce documents for various purposes and*
- *apply mail merge facility to send a document to different members.*

I like the computer because it keeps giving you options. What if I do this? You try it, and if you don't like it you undo it. The original can always be resurrected. It raises the idea of working on one painting your whole life, saving it and working on it again and again.

Elliott Green
Research Associate and Tutorial Fellow, Oxford University

Introduction

We have to submit a project as part of our course evaluation. We will perhaps take a chart paper and design the project, write a report and submit it to our teacher. That's the way we have done it all along? Have we ever thought of typing the entire project report using a computer and submitting it in a nicely designed printed form? Ever reflected on getting information from the Internet and presenting it neatly for the project? Now that's the way things are being done! And if we are already thinking of it, it's time to discover some document creation software, i.e., *word processing* tool to get the job done. Not only a project, we can get lots of other things done through it – writing letters and applications, making newsletters, designing posters, and the list goes on and on!

Computers are dominating our lives today in more ways than we know. The power of computers can however be seen in the word processing tools.

3.1 WORD PROCESSING

Word processing is the ability to create documents using a word processor. It can also refer to advanced shorthand techniques, sometimes used in specialised contexts with a specially modified typewriter. These were primarily aimed at typists, particularly in offices where other workers sent handwritten notes to be transcribed into documents for printing which were returned for reviewing. The word processing operators achieved considerable time saving largely due to:

- the faster typing speeds achieved as a result of electronic keyboards
- the assistance of the word processing software for functions like layout and spell check, etc.

Today, there are different word processors available; some are proprietary like Microsoft Word, WordPerfect Office, StarOffice Writer, etc., while others are open source like Kwrite, Openoffice.org Writer, etc. Basic functions in all remain more or less similar and do not require advanced computer or typing skills for use. However, a complete word processor is that which lets us work with text and other features, for example, pictures, tables, artistic texts, to create interesting and meaningful pages. We can make our own posters for bulletin board, type letters and attach them as documents to an e-mail, etc. Since MS Word, an integral component of MS-Office, is one of the programs which provides all these features and many more and is also being mostly used due to its ease of usage, we have taken it as a sample Word Processing Tool.

3.2 STARTING THE WORD PROCESSOR

Most of the time, we will be able to start the word processor of our choice from the *Program* option under the *Windows Start menu*. Of course, we might also create a shortcut on the desktop to access our word processor.

For example, to start Microsoft Word, click on

- 

, then on
- 

, and lastly on
- 

as shown in figure 3.1.

3.2.1 Anatomy of the Application Window

The first and foremost task is to get acquainted with the application window of the word processing package that we are planning to use. As already mentioned, most of the packages allow the user to perform identical tasks; their application windows too appear by and large comparable. The important components of this are:

- **Menu Bar :** Provides menu options like File, Edit, View, etc.

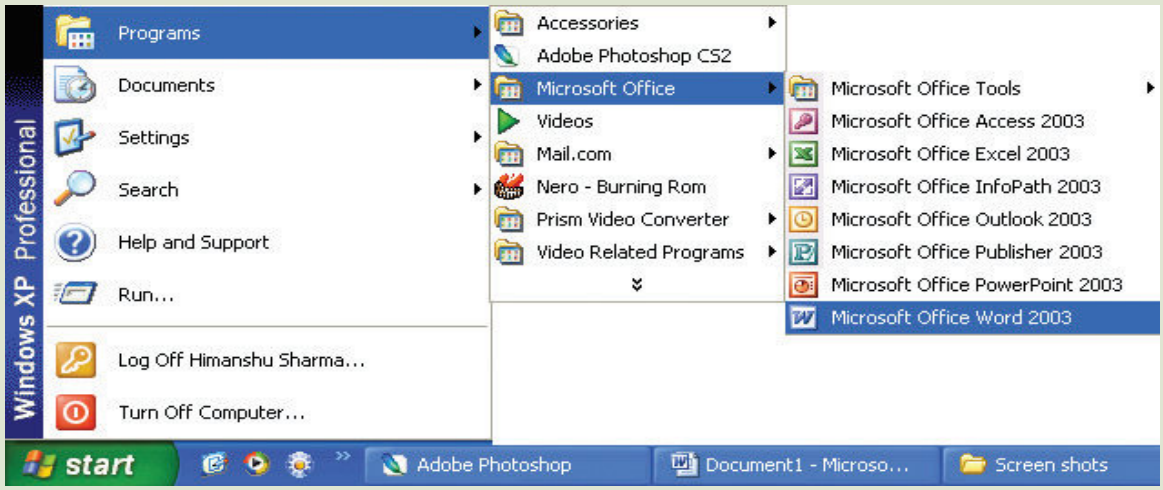


Figure 3.1 : Selecting Word to start

- **Standard Toolbar :** Contains tools for standard tasks, like saving, printing, cutting, copying, pasting, etc.
- **Formatting Toolbar :** Provides tools for formatting like bold, italic, underline, etc.
- **View Buttons :** Provides options to switch between Normal, Web Layout, Print Layout, Outline and Reading views.
- **Tab stop:** A position we set for placing and aligning text on a page.
- **Drawing ToolBar :** Provides tools for drawing basic shapes, inserting pictures, changing colors, etc.
- **Status Bar :** This provides information about the current document.

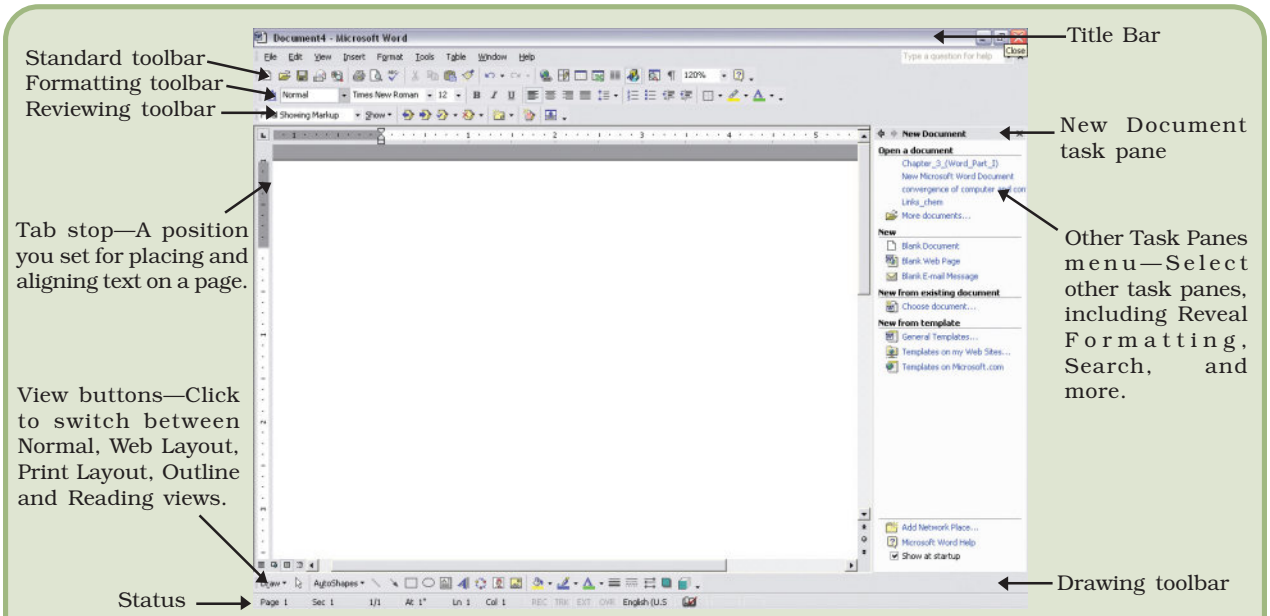


Figure 3.2 : Application Window

Other programs like WordPad, NotePad could also be used to create word documents, but these programs lack certain important features as compared to MS-Word. Therefore MS-Word is a more complete package for word processing.

When we start MS-Word, a blank document opens up. Word names the document as *Document1* (Figure 3.2). We can also start a new document in any of the following ways:

- Click on *New* button ( ) on the *Standard toolbar*, or
- Click on *New* option in the *File* menu (Figure 3.3).

After we have started a new document, type in some introductory text into the document. When we start a new document, the *insertion point* (the blinking vertical line, also called cursor) appears in the first column of the first line. We can just type the text, and it will appear where the insertion point is. But in a document where we already have the text, we can place the insertion point anywhere in the text by clicking the mouse pointing at the desired location.

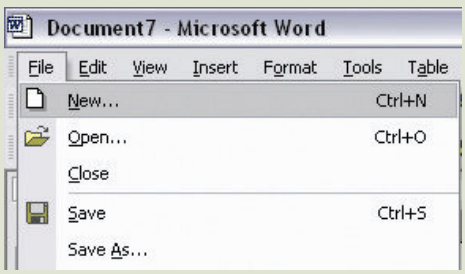


Figure 3.3 : To open new document from file menu

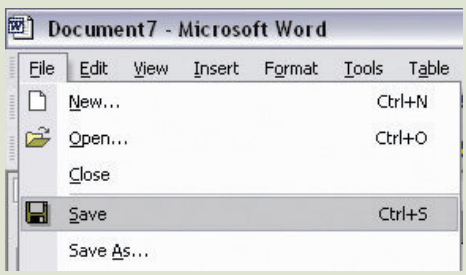


Figure 3.4 : To save a document from file menu

3.3 HOW TO SAVE A DOCUMENT?

- Click on *Save* button ( ) on the formatting toolbar, or
- Click on the *Save* option in the *File* menu (Figure 3.4).

The *Save As* dialog box appears (Figure 3.5). It's a good idea to give the new document a name and save it as soon as we create it.

The steps we should follow to save our document are as follows:

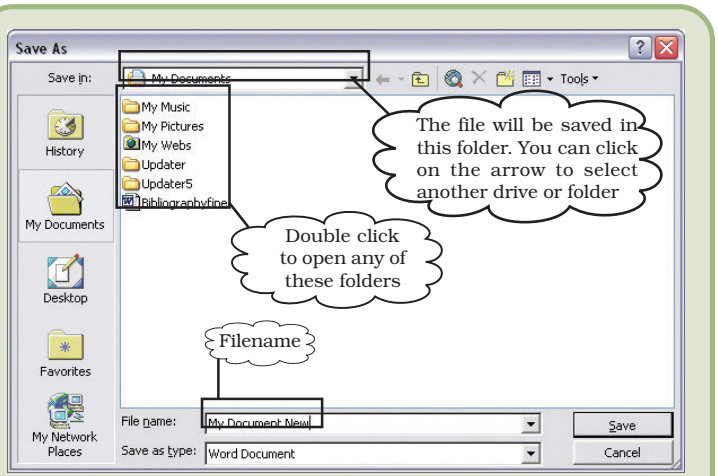


Figure 3.5 : Save As dialog box

- Automatically, we will save our file in *My Documents* folder. If we need to save in some other location, navigate towards it by clicking on the arrow on the right, and selecting one of the available options. Select the location. Figure 3.5 shows the drive/folder/sub-folder where we want to save the document.
- Type the filename as *Document New and* Type of document as *Word document.*
- Click on the *Save* button.

We can cancel the process at any time by clicking on the *Cancel* button.

3.4 HOW TO OPEN AN EXISTING DOCUMENT

- Click on *Open* under *File* menu, or click on tool on the *Standard* toolbar.
- The *Open* dialog box is seen on the screen. This is similar to the *Save As* dialog box.
- Navigate to the folder where our file is located, select the filename.
- Click on *Open.*

3.5 FORMATTING TEXT

Formatting refers to the way our text will look like – the design of the characters, their size, the space between paragraphs, their alignment, etc.

First, selection of text.

- By using the mouse, position the insertion point (by clicking the mouse) at the beginning or end of the block to be selected and then click and drag to the end or beginning of the block.

- By using the shortcuts:
  - Double-click on a word to select it.
  - Triple-click on a paragraph to select it.
  - Ctrl+click on a sentence to select it.

There are basically two types of formatting:

- Character formatting, and
- Paragraph formatting

3.5.1 Character Formatting

Character formatting is the one which we can apply to any individual character or to a group of characters. It has the following options (Figure 3.6):

Font : This decides the appearance of our characters.

Font Style : We can make characters stand out by making them Bold, Italic or both.

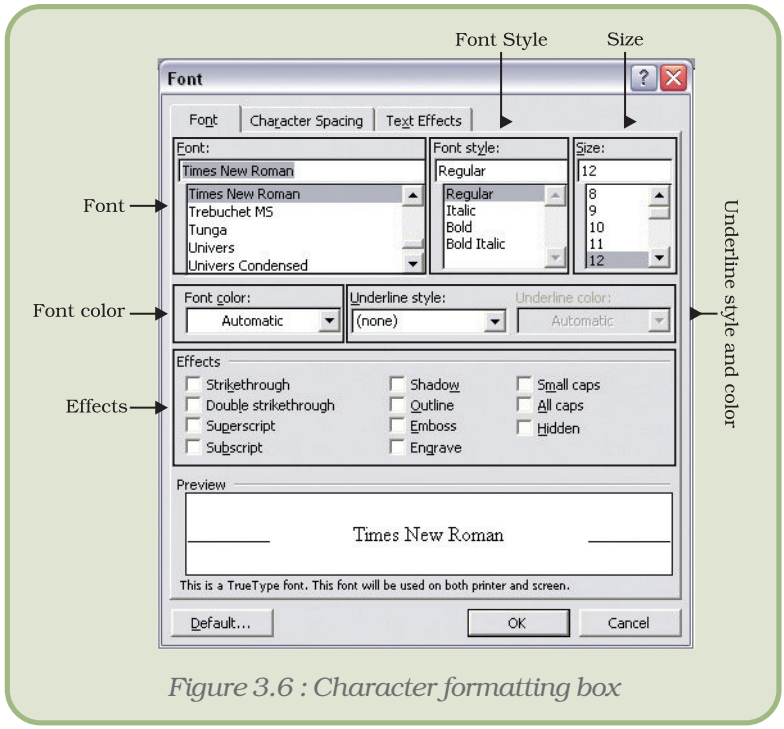


Figure 3.6 : Character formatting box

Size : This increases/decreases the size of the characters – the size measured in points (72 points =1 inch)

Font Color : We can apply colours to the characters for printing the final document.

Underline : We can draw attention to some particular text by underlining it.

Effects : We can also apply effects to our text. Two most common ones are Superscript and Subscript. The *2* in 3^2 is a superscript. To make a character into superscript, we need to select only that character, and click the box against Superscript. Similarly, *1* in T_1 is a subscript.

3.5.2 Paragraph Formatting

There are some formatting features that get applied to an entire paragraph or paragraphs, but not to any given character or a group thereof. Such formatting features are described as *Paragraph formatting*.

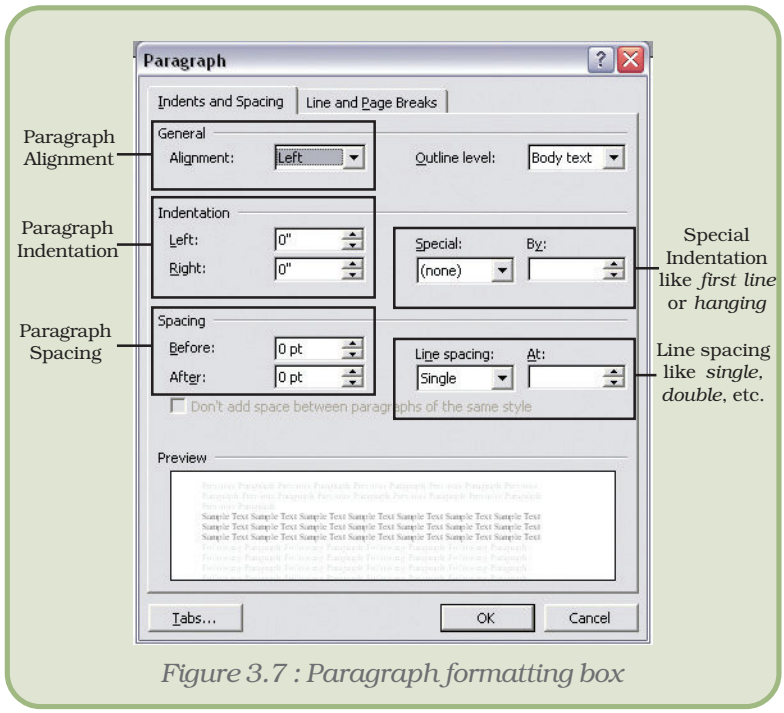


Figure 3.7 : Paragraph formatting box

It provides the following options (Figure 3.7):

Alignment : The alignment of a paragraph may be *left*, *center*, *right* or *justify* as given in Table 3.1.

Indentation : Indents are the left and right boundaries of selected paragraphs within a document. This may be necessary when different paragraphs have different left and right boundaries. For example, we can see the indentation in poems. The indentation options available in most word processors are

Table 3.1 : Different types of Alignments

Alignment	Description
Left Alignment	All the lines of the paragraph will be aligned on the left.
Right Alignment	All the lines of the paragraph will be aligned on the right.
Center Alignment	All the lines of the paragraph will align to the center.
Justify	The left as well as the right side of the paragraph will be aligned except for the last line.

Left and *Right*. Apart from these, we can have special indentation in the form of *First Line* and *Hanging*.

Spacing : This option allows us to have some space before and/or after a paragraph or a group of paragraphs. We can select the paragraph(s) and select or type in the desired value against the appropriate option – *Before* or *After*. These values are measured in points.

There is also a *Line spacing* option, which decides on the spacing between the lines of the paragraph. Normally we will type with the value *Single* for it. But if we want to have more space between the lines, we can select *1.5 lines* or *Double* for it.

Activity 3.1

Type "We are changing the font". Try the activity by using the following options:

- font *Arial*,
- font style *Italic*,
- size *10 point*,
- font colour blue,
- underline style - a simple line,
- underline colour green, and
- effects *Small Cap*.
- right alignment,
- indentation *1 inch* for left as well as right,
- *first line* indent *0.5 inch*,
- spacing as *6 point* both before and after the paragraph and
- line spacing *1.5 lines*.

3.5.3 To Add Bullets or Numbering

Bullets are small dots, squares, dashes or graphics that are often seen before the text (word, line, sentence, paragraph or any other object). To add bullets,

- Select the object
- Click on *Bullets and Numbering* from *Format* menu to open the *Bullets and Numbering dialog box* (Figure 3.8)

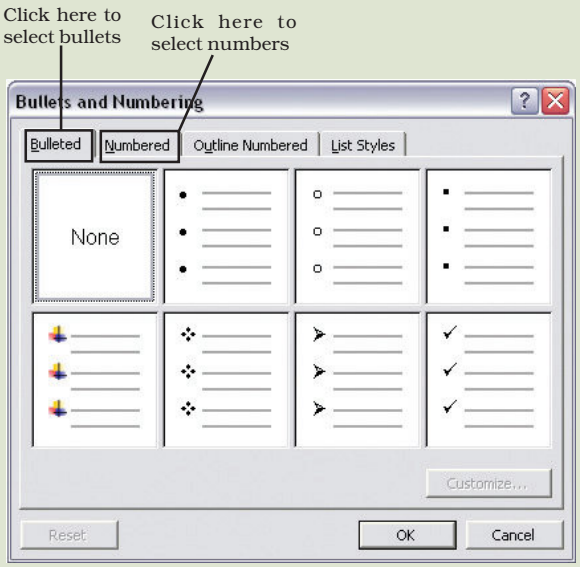


Figure 3.8 : Bullets and numbering dialog box

Click on the bullet of your choice, and click *OK*.

Instead of a bullet, a number may also precede a group of paragaphs. To do so, proceed as follows:

- Choose the numbered tab from *Bullets and Numbering* of *Format* menu to view the numbering options.
- Select the numbering option of choice, and click *OK*.

To remove bullet(s) or number(s) applied to paragraph(s), select the paragraph(s), open the *Bullets and Numbering* dialog box, and select *None* in *Bulleted* or *Numbered* tab. Click on *OK*.

Many of the formatting options discussed above can be applied through the *Formatting Toolbar (Appendix 3.1 Tools in Formatting Toolbar)*.

The tools for Bold (B), Italic (I), Underline (U), Shadow, Numbering, and Bullets act as toggles – that is, the desired formatting will be applied if it is not already applied to the selected text, else it will remove that formatting.

3.5.4 Using Tabs to Arrange Data

The tab setting allows us to align the text at a particular point, or to create a tabular layout. Try this out – open a new document and

- type *2 3 4 5 6*, pressing the tab key after every digit. Press the *Enter* key.
- type *22 33 44 55* and *66*, again pressing tab key after every number (type 22, press tab, type 33, press tab, and so on).

3.6 A GLANCE INTO VIEWS

Most word processors provide us multiple views: we can select the one that suits the work at hand. We can display our document in one of the five views: Normal layout, Web Layout, Print Layout, Reading Layout or Online Layout.

- *Normal Layout*
  Normal layout view shows formatting such as line spacing, font, point size and italics.

- *Web Layout*
  Web layout view enables us to view our document as it would appear in a web browser such as the Internet Explorer.

- *Print Layout*
  The ***Print Layout*** view shows how the document will look when it is printed.
- *Reading Layout*
  Reading Layout view formats our screen to make reading our document more comfortable.
- *Outline Layout*
  Outline view displays the document in outline form. Only headings can be displayed hiding the text under them. We can just move a heading; the accompanying text will automatically move with it.

We can opt for any one of the available views by selecting it from the *View* menu, or clicking on the appropriate *View Buttons* –  .

3.7 CREATE A TABLE

Tables provide a neat way to present complex information in vertical columns and horizontal rows of cells. Each cell can contain text – a single paragraph or multiple paragraphs – or graphics. To insert a table:

- click on *Insert* in the *Table* menu and select on *Table* from resulting menu. (Figure 3.9)
- This opens up the *Insert Table* dialog box (*Figure 3.10)*. Type in some value for the number of columns and rows... let us type in the values 5 and 4 respectively.
- We can now see this table (*Figure 3.11)* on the page – with 5 columns and 4 rows
- Time to type in some text! We can move the insertion point from one cell to another by clicking the mouse at the desired cell. We can also press the *Tab* key to move to the next cell, or *Shift+Tab* keys to move to the previous one. !, !, ! and ! keys can also be used for this.

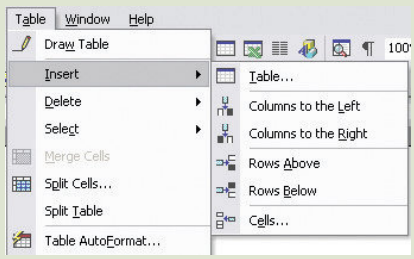


Figure 3.9: To insert table in the document



Figure 3.10 : Insert Table dialog box



Figure 3.11 : Blank table created

- When a table is inserted, all columns are of same width and all rows are of same height. To change their size, move the mouse pointer to the line separating the rows or columns. If the mouse is at column separator, it will change to ⇿; if it is on the line bordering two rows, it changes to ⇳. Now drag the mouse to change the size of the column or row. If the cell is selected, then only the size of the selected cell changes instead of the entire column or row.
- Type in the text and adjust the column widths to make a table as shown in Table 3.2:

Table 3.2: Sections and Houses of Class XI Students

Roll No	Name	Class	Section	House
1	Vijaya	XI	A	Red
2	Lalruata	XI	B	Blue
3	Kabir	XI	A	Yellow

There are times when we need to change the number of rows/ columns after we have inserted the table. There are two options each for rows and columns in the *Table* menu.

- To insert columns, use the options Columns to the Left or Columns to the Right under *Insert* option of *Table* menu. Put the insertion point in any cell at the column adjacent to the location where the new column is to be inserted, and select the appropriate option.
- For rows, the options are Rows Above and Rows Below. We can use these like we did for inserting columns.

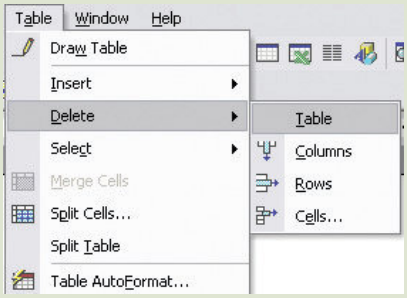


Figure 3.12 : Table menu for delete options

To delete row(s) or column(s), we can utilise the *Delete* option under the *Table* menu. The various alternatives under this option are seen in figure 3.12.

Select cell(s) in appropriate row(s) or column(s), and click on the choice to delete *Rows* or *Columns* as desired. To delete the entire table, put the insertion point somewhere in the table and click on *Table* under *Delete* option.

Two or more cells can be merged into a single cell. Alternatively, a single cell can be split into several new cells. These options are also available under the *Table* menu as seen in the figure above. To merge cells, select two or more cells and click on Merge Cells. To split cell(s), select the cell(s) and click on Split Cells... . The *Split Cells*

dialog box appears, soliciting the number of rows and columns into which we would like to split the cell(s).

The easiest and quickest way to decorate the table:

Click on Table AutoFormat... under the *Table* menu. *Table Autoformat* dialog box appears.

Let us decorate the table we had created:

- Place the insertion point anywhere in the table.
- Open the table menu, and click on *Table Autoformat.*
- In the *Table AutoFormat* dialog box (Figure 3.13), select *Contemporary*. We can observe the preview portion of the dialog to see the effect.

Click on *Apply*. Our simple table now looks very different (Table 3.3) from what it originally was.

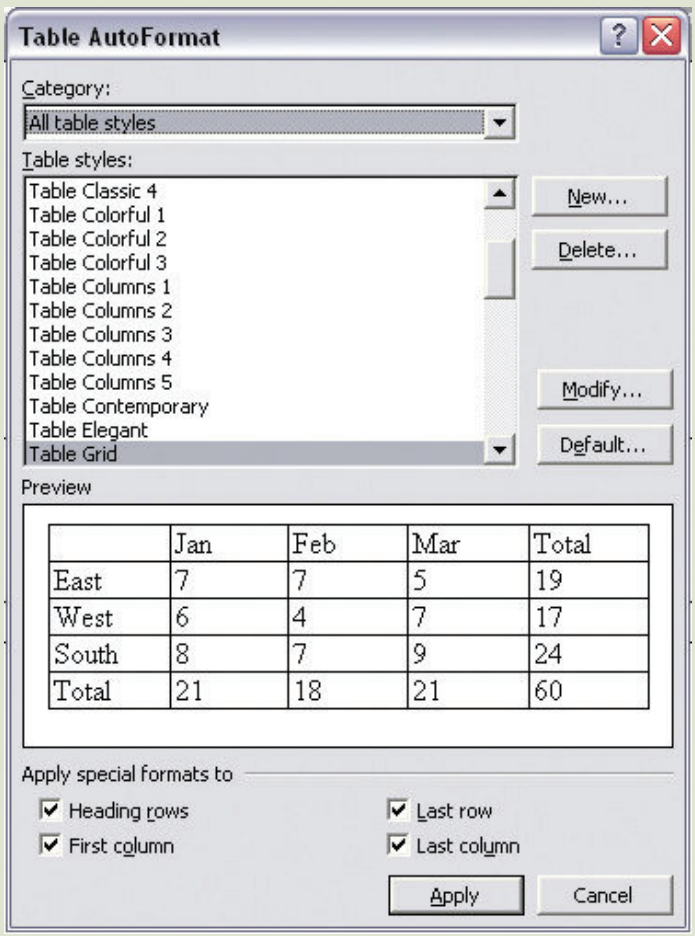


Figure 3.13 : Table AutoFormat dialog box

3.8 INSERTING PICTURE IN A DOCUMENT

Graphics can add interest and impact to the documents. Suppose we have completed a letter telling our friends about the great party we threw for a birthday. The words capture the festive mood of the event, but that page of text looks lifeless and dull. We need graphics to enliven our prose.

Table 3.3 : AutoFormatted Table 3.2

Roll No	Name	Class	Section	House
1	Vijaya	XI	A	Red
2	Lalruata	XI	B	Blue
3	Kabir	XI	A	Yellow

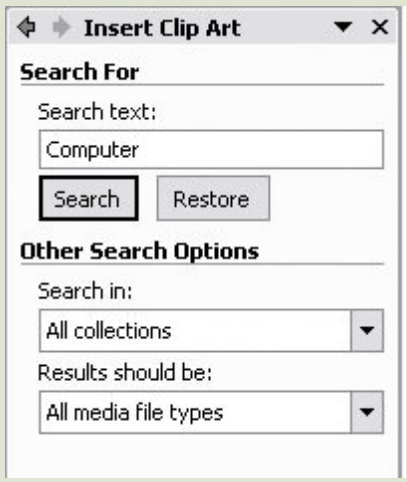


Figure 3.14 : Clip Art task pane

We can insert picture from a picture file or we can use any of the clip arts provided with MS-Word or any word processor of our choice.

3.8.1 Insert a Clip Art

Let us insert a clip art into our *Document New* file:

- Open the *Document New* file.
- On the *Insert* menu, select *Picture*, and then click *Clip Art*.
- The *Clip Art* task pane opens up. (Figure 3.14)
- In the *Clip Art* task pane, type the search term (for example, "computer") in the *Search* for field, and click on the *Search* button. If we are not looking for anything in particular, don't type in any text, just click.
- Select the insertion point in the document where we want to insert clip art (Figure 3.15 (a)), and then click the clip we want on the task pane (Figure 3.15 (b)).

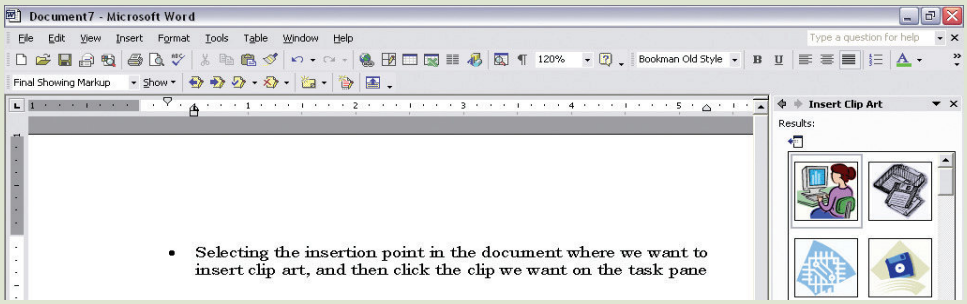


Figure 3.15 (a) : Selecting the insertion point , (b) Selecting the clip art

- The clip art will get placed where the insertion point was (Figure 3.15 (c)).

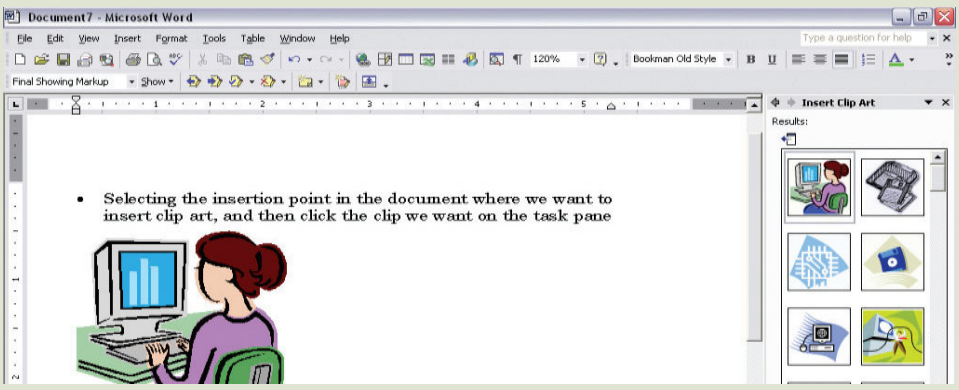


Figure 3.15 (c) : Inserting clip art in the document

3.8.2 To Insert a Graphic From a File

- On the Insert menu, select *Picture*, and then click from *File*.
- The *Insert Picture* dialog box opens up. *Browse* the graphic file.
- Click the file, and then click *Insert*.
- The picture gets inserted where the insertion point was located.

3.8.3 To Apply Wrapping Style

We have inserted a clip art or picture, but we do not want blank space to the right and left of the picture. No problem, we can further refine the layout of the graphic and text. Using the five wrapping styles, we can create documents with just the look we want.

To apply wrapping styles to a graphic,

- Click on the graphic to select it.
- On the *Format* menu, click *Picture*.
- In the *Format Picture* dialog box, click the *Layout* tab.
- Click the preferred wrapping style, and then click *OK*.
  Different Wrapping styles are given in Appendix 3.3.

3.9 HOW TO COPY, MOVE AND DELETE TEXT

Any word processor will allow us to copy or move text/graphics from one part of the document to another or from one document to another. If the same text is appearing in more than one place, the copy option can save us from quite a lot of trouble. If we want to reorganise the document by changing the position of certain text, we need not delete the text from existing location and re-type at the new location – just move it from its current location to the desired location.

To copy or move, proceed as follows:

- Select the item to copy or move. This can be a character, a few words, some paragraphs or a graphic.
- If we want to copy, click on *Copy* from *Edit* menu. Alternatively, we can click on  tool on the *Standard* toolbar.
- If we want to move, click on *Cut* from *Edit* menu. Alternatively, we can click on  tool on the *Standard* toolbar.
- Place the insertion point at the destination location (this may be within the same document, or in another document), where we want the text or graphic to be copied or moved.
- Click on *Paste* from *Edit* menu. Alternatively, we can click on  tool on the *Standard* toolbar.

To delete some text or graphic, select the same and simply press the *Delete* key.

3.10 CHECKING SPELLING AND GRAMMAR



Figure 3.16 : Tools *menu*

Checking spelling and grammar in a document after we finish typing and editing the text is very useful. We can check for possible mistakes and then confirm each correction. In Microsoft Word, we can start the spell checker by clicking on *Spelling and Grammar* option under *Tools* menu (Figure 3.16).

When the spell checker finds a spelling mistake, a dialog box or task pane (Figure 3.17) is displayed and the first misspelt word found by the spelling checker is selected.

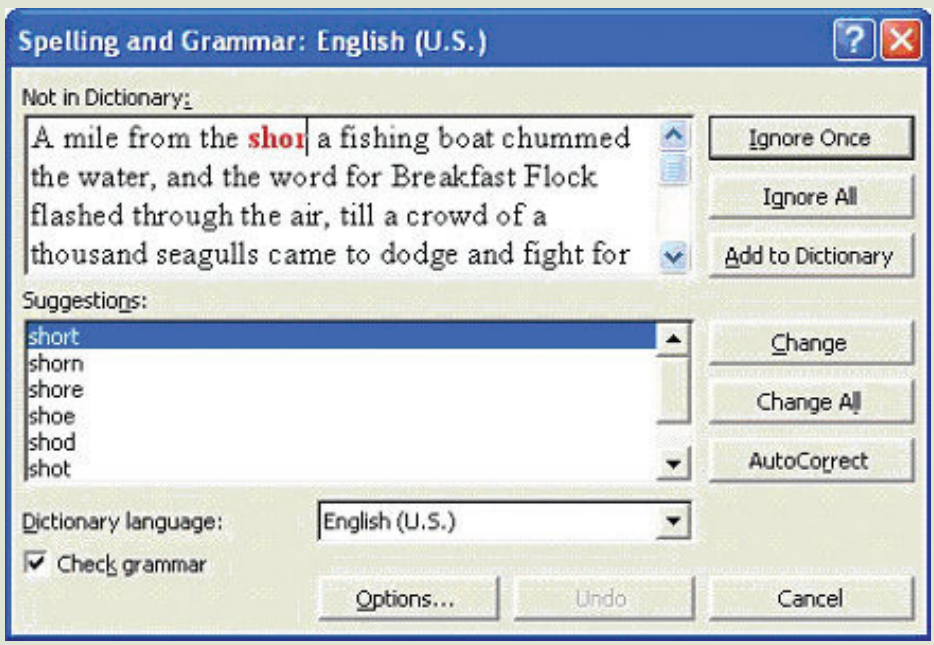


Figure 3.17: Task pane for Spelling and Grammar

We can resolve each error that the program finds in different ways:

- We can use one of the words suggested by the word processor and click *Change*.
- We may want to change the word ourselves. Click the word on the document (not in the *Spelling and Grammar* dialog box) and edit it. After fixing the error, click on *Resume*.
- The indicated word may actually be the correct one, but not available in the Dictionary; for example, the name of the town *Shillong*. To include such word into the word processor's dictionary, click *Add to dictionary*. If, we would like to ignore it, click *Ignore once*. If we want to ignore all instances of such cases in the document then click *Ignore All*.

After we resolve each misspelt word, the word processor flags the next misspelt word so that we can decide what we want to do.

After the program finishes flagging the spelling mistakes, it begins showing us the grammatical mistakes. We can proceed in a similar fashion to correct those also.

Alternatively, we can check spelling automatically while we type. In that case, we can be more confident that we won't need to correct a lot of spelling mistakes when we are ready to deliver our document. Word flags misspelt words by underlining them with a wavy red line (Figure 3.18) so that we can easily spot them. We can right-click the misspelt word to see suggested corrections on the resulting shortcut menu.

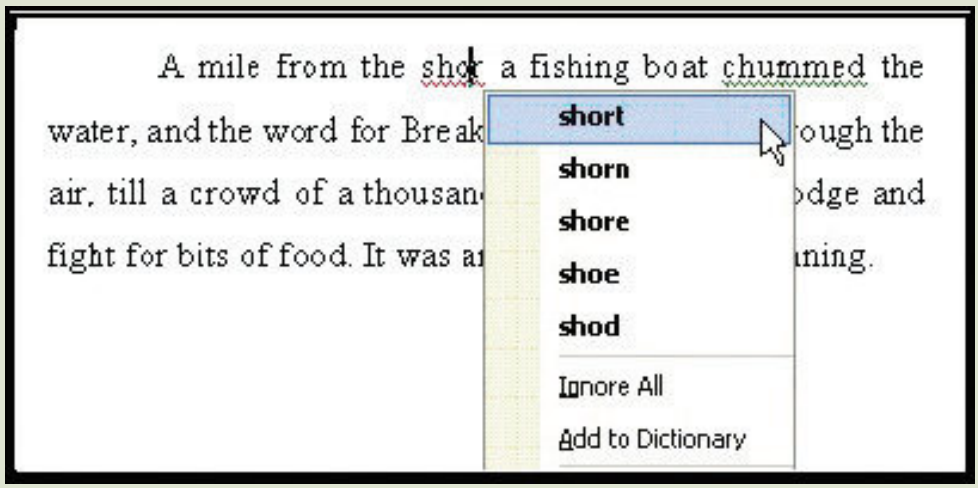


Figure 3.18 : Entering text with Spellchecker on

Similarly, the grammar mistakes are flagged by a wavy green underline – we can correct these just as we corrected the spellings.

However, don't blindly accept the corrections suggested by the word processor. The word processor is not always accurate in detecting spelling and grammar errors!

3.11 SETTING PAGE LAYOUT

When a document is to be printed, the word processor has to be told as to how the document should appear on the page, i.e., its paper size, margins, layout of the paper, etc.

To alter the page setup, click on *Page Setup* under the *File* menu. In the resulting Page Setup dialog box (Figure 3.19), set the margins to the required values. Let us set the margins as *Top – 1 inch, Bottom – 1 inch, Left – 1.25 inch* and *Right – 1.25 inch*.

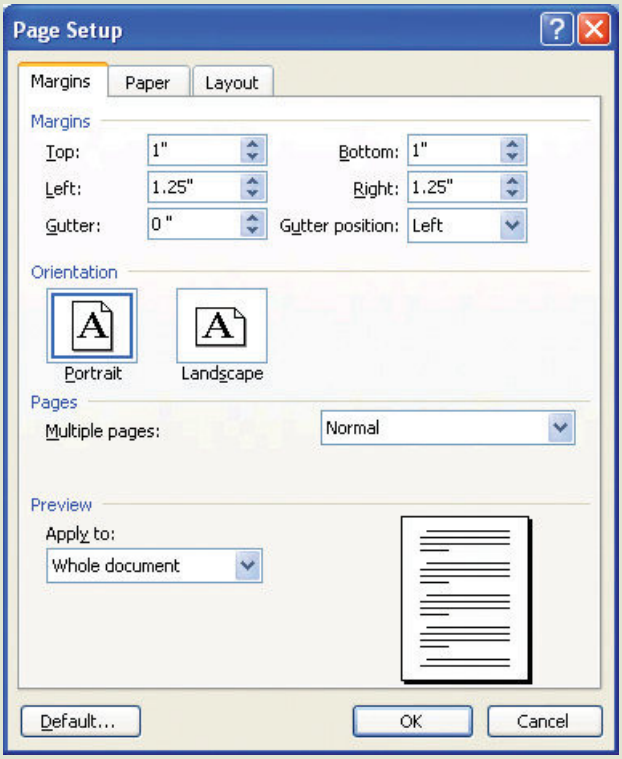


Figure 3.19 : Page set up dialog box

Apart from the four margins, we may set the following:

- *Gutter* is the space left on one side for stitching and binding – give an appropriate value, if required.
- The orientation decides whether the page will be printed lengthwise (portrait) or across its breadth (landscape). In other words, *Portrait* is taller than it is wide; *Landscape* is wider than it is tall. The orientation buttons themselves are quite self-explanatory.

In the *Paper* tab, select the paper size on which we are going to print the document. There are standard paper sizes like *letter*, *A4*, *legal* etc. Either we can select one from these or we can enter the width and height of the paper we are using.

Click *OK* once we have typed in the values for margins, chosen the orientation, and selected the paper size.

3.12 MAIL TO MANY IN SIMPLE STEPS – THE MAIL MERGE

We use ***mail merge*** when we want to create a set of documents that are essentially the same except that each contains some unique elements. For example, in a letter to invite friends to a birthday party, the date of invitation and the text thereof will be same everywhere, but the address and greeting line will be different in each letter.

Using mail merge, we can create:

- A set of labels for envelopes : The return address is the same on all the labels or envelopes, but the destination address is unique on each one.
- A set of form letters, e-mail message or faxes : The basic content is the same in all the letters, messages or faxes, but each contains information that is specific to the individual recipient, such as name, address or some other piece of personal data.

Creating each letter, message, fax, label, envelope, etc. individually would take hours. That's where mail merge comes in. Using mail merge,

all we have to do is create one document that contains the information that is the same in each version. Then we just add some placeholders for the information that is unique to each version. The ***word processor*** will take care of the rest.

We can prepare mail-merged documents by using this facility as described in Appendix 3.2.

Summary

- A word processor is a software for typing, formatting and creating documents.
- There are two types of formatting that we can apply – *character formatting* and *paragraph formatting*.
- For *character formatting*, we must first select all the characters where we want to apply the formatting. For *paragraph formatting*, it is enough to have any part of the paragraph selected – for a single paragraph, it is sufficient to place the insertion point somewhere in that paragraph.
- Character formatting includes – *font*, *font style*, *size*, *font colour*, *underline style*, *underline colour*, and *effects* – for example *subscript*, *superscript*, *emboss*, etc.
- Paragraph formatting comprises of – *alignment*; *indents* – left, right, first line and hanging; *space before* and *after* paragraphs; and *line spacing*.
- To highlight the points, we can use bullets or numbering for the paragraphs.
- If we plan to put tabular data, we can either use *tabs* – left, right, center and decimal; or use *table* to type in the text within the cells.
- To enhance the appeal of the document, we can insert pictures – either from clip art, or from files. We might have to select appropriate wrapping options to have the text around the picture.
- We can move or duplicate text in a document or across documents using options like *Cut*, *Copy* and *Paste*.
- If we are likely to make mistakes (and all of us are!), we can utilise the word processor to check the spellings and grammar.
- Before we print the document, we must decide on margins, page size, gutter etc. through *Page Setup*.
- If we need to have many copies of documents which are same except for some parts, like invitation letters, we can use the *mail merge* facility to make the task simpler.
- We can allow others to review the documents by editing as well as by adding comments. These changes can be tracked. We can later decide as to whether to keep those changes or to revert back to the original text.

EXERCISES

Short Answer Type Questions

1. What is a cursor?
2. How many types of text alignments are there?
3. What are the methods of selecting a line in MS-Word?
4. How many types of page orientations are there in page setup?
5. What are the views used in word processors?
6. How can words be added in word processors, dictionary?
7. List the advantages of word processors.

Long Answer Type Questions

1. Give the steps to insert a clip art picture to your document.
2. What is formatting? Discuss the different types of formatting that you can have using a word processor.
3. Discuss the different types of indentation.
4. How is line spacing different from space before or after paragraphs?
5. What are the various facets of Paragraph Formatting? Explain each one clearly.
6. Explain the process of applying bullets to some paragraphs in a document.
7. What is tab? How do they assist in the process of formatting?
8. What is style? Discuss the steps involved in defining styles. What is the use of style for *next paragraph*?
9. How do you change the features of an existing style?
10. How do you insert table in your document? Discuss the steps involved in splitting and merging cells.
11. Discuss the various text wrapping options available when you insert a picture in your document.
12. Explain the utility of mail merge.
13. Define mail merging in word processor.

Multiple Choice Questions

Identify the most appropriate option for the following :

1. To increase the space on the left for just one paragraph in a page, you can adjust
   (i) Left indent
   (ii) Right indent
   (iii) Alignment
   (iv) Tabs

2. When you want to repeat the same formatting at different places in your document, you can take the help of
   (i) Character formatting
   (ii) Paragraph formatting
   (iii) Style
   (iv) Tabs

3. Which of the following is not character formatting?
   (i) Text Colour
   (ii) Alignment
   (iii) Font
   (iv) Subscript

4. Which of the following is not a paragraph formatting?
   (i) Alignment
   (ii) Indentation
   (iii) Line Spacing
   (iv) Underline style

5. Which of the following cannot be included in a style?
   (i) Paragraph formatting
   (ii) Character formatting
   (iii) Table
   (iv) Numbering

Activities

1 The following interview letter is to be sent to all the candidates who had applied for admission to XYZ College, informing them the respective date and time of interviews. The name, address, date and time of interview for each candidate is given. Use Mail Merge to perform this task. Save your work in the folder created in question number 1.

XYZ COLLEGE : PQRPUR

Dear..... Date : .....

Apropos your application for admission to the Degree course on ..... at this college, you are requested to attend the interview on ..... at ..... The interview will be held at the Principal's office. You are to bring :

(i) The higher secondary marksheet.
(ii) Birth certificate
(iii) Character certificate from the last institution attended.

Please note the following :

- Attending the interview does not qualify you for admission.
- In case of any delay on your part, your candidature will stand cancelled.

Principal.

The data for the Merging are as follows:

Name	Address	City	Date	Time	Course
S. Khongwir	Malki	Shillong	10/6/08	9:30	Comp. Sc.
P. Sharma	Malviya Nagar	New Delhi	10/6/08	11:30	B.B.A.
S. Sahoo	Baily Road	Patna	11/6/08	10:45	Mass Comm.
P. Deka	Dispur	Guwahati	12/6/08	9:30	Biotechnology
A. Sema	Church road	Dimapur	12/6/08	12:30	Pisiculture

2. Type the text given below, taking note of all the formatting.

Don't skim over this

Tibetan monks consumed a bowl of this wonder food a day, and lived to the ripe old age of 109. Ayurvedic practitioners have prescribed it for 5,000 years and health-food buffs swear by its magical properties.

Yet today the reports are conflicting. Because milk, the main ingredient in the preparation of yoghurt, is considered by many nutritionists to be highly mucous-forming and difficult to digest, yoghurt has received a step-motherly treatment from the medical community. Yet ounce for ounce, it packs more calcium, protein, riboflavin, phosphorous and vitamin B12 than milk.

Type of milk used to prepare yoghurt	Protein (g) (g)	Fat (g) (g)	Carbohydrates (g)	Calories (g)
Buffalo	89	14	6.3	182
Cow	7	9	9.6	160
Skim Milk	***8.4***	***0.2***	***6.3***	***69***

3. Type the text given below, taking note of all the formatting.

Covering All Bases

Dev Dasgupta, 35, is a middle-level manager in a private bank. He's taken a householder's policy to insure his house (valued at Rs 20 lakh), its contents (valued at Rs 3 lakh) and his wife's jewellery (Rs 50,000). He also has a comprehensive cover for his pride and joy, a zippy, new Maruti Zen (cost: Rs 3.6 lakh). Additionally, he's bought a personal accident cover for Rs 5 lakh, and a health cover of Rs 2 lakh each for himself and his wife. Here's what he pays to secure everything he values. Well, almost everything...

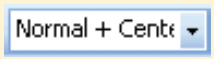
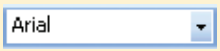
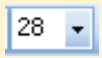
Insurance For	Premium	
	For amount (Rs.)	Payable (Rs.)
Fire and allied perils	20 lakh	1,300
Contents	3 lakh	195
Burglary, theft, housebreaking	3 lakh	720

Jeweller	50,000	500
Personal Accident	5 lakh	750
Health		4658
New Maruti Zen	3.6 lakh	12,007
Total Premium		**20,130**

4. Get some pictures of your school. Now design a calendar for the next year, with one picture for every month of the year.

APPENDICES

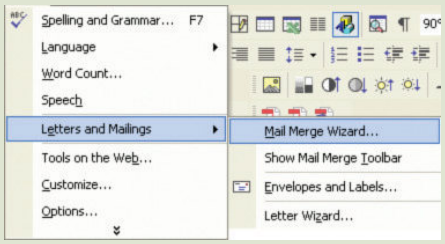
Appendix 3.1 : Tools in Formatting Toolbar

	*Style*. We can apply a style to the selected paragraph using this option.		*Styles and Formatting*. Opens the Styles and Formatting task pane; we can use this task pane to define and apply styles or formatting.
	*Font*. We can change font of selected text through this option.		*Size*. We can change size of selected text through this.
	*Bold*. We can make selected text Bold through this option.		*Italic*. We can make selected text Italic through this option.
	*Underline*. We can underline selected text through this option. But we cannot select the type of underline – for that we have to open *Font* dialog box.		*Align Left*. We can use this to left align selected paragraph(s).
	*Center*. We can use this to center align selected paragraph(s).		*Align Right*. We can use this to right align the selected paragraph(s).
	*Justify*. We can use this to change the alignment of selected paragraph(s) to *justify*.		*Line Spacing*. We can use this to make the line spacing of paragraph(s) to single, double, etc.
	*Numbering*. We can make selected paragraph(s) numbered. But we cannot change the type of numbering by this option.		*Bullets*. We can apply bullets to selected paragraph(s). But we cannot change the type of bullets by this option.
	*Decrease Indent*. This option allows us to move selected paragraph(s) to the left, if not already at extreme left.		*Increase Indent*. This option allows us to move selected paragraph(s) to the right.

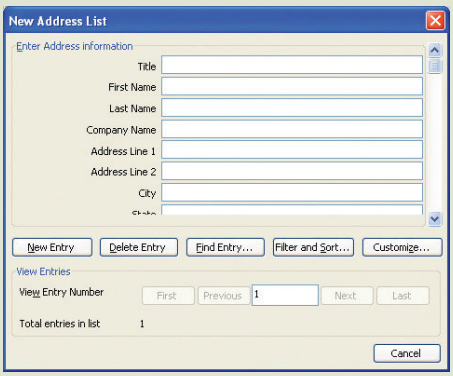
	*Border*. We can use this to apply different borders to paragraph(s) or table(s).		*Highlight*. We can use this tool to highlight selected text.
	*Font Color*. This option allows us to change the color of selected text.		

Appendix 3.2 : Mail Merge

Mail to Many in Simple Steps



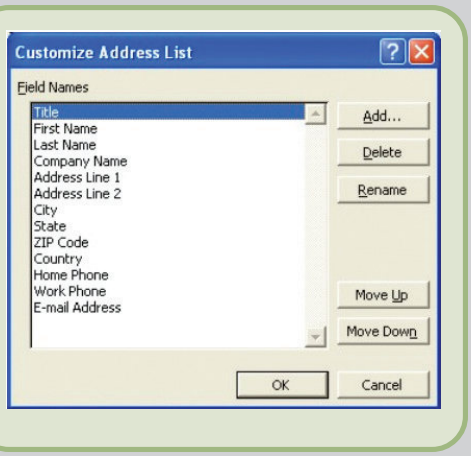


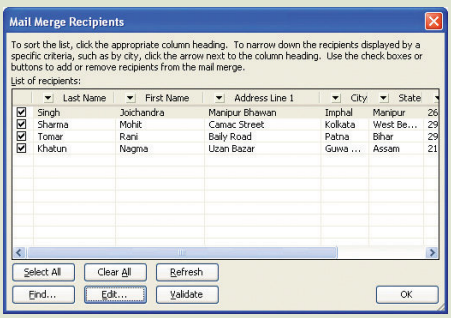


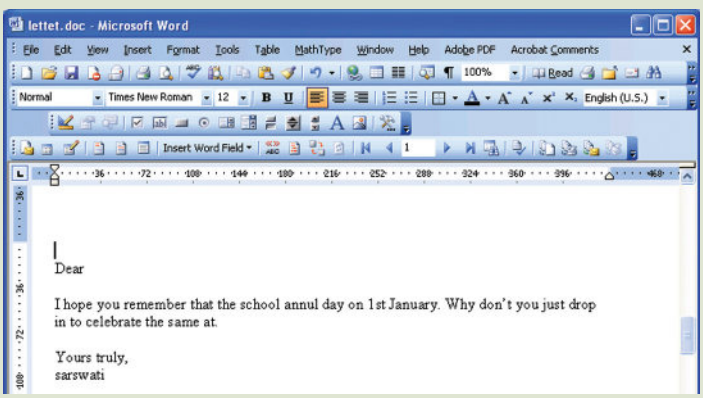
In Word, we initiate the process of mail merging by starting the *Mail Merge Wizard* from the *Tools* menu.

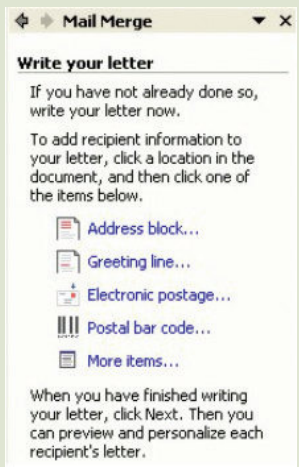
- The *Mail Merge Task Pane* becomes visible in the task pane, asking us to select the type of document we want – letters, e-mail messages, envelopes, labels, etc. Since we want to invite your friends through a letter, select *Letters*, and click on *Next* at the bottom of the pane (not seen in the figure).
- Microsoft Word now prompts for *Selecting starting document*. The options provided are *Use the current document*, *Start from a template*, and *Start from existing document*. Select the first option. We can later try out the others on our own!
- We now have to provide the details or the receipients – like name, address, etc. which will be different for every letter. The options provided in the task pane are *Use an existing list*, *Select from Outlook contacts* and *Type a new list*. We have not yet made any list of friends we would invite, so select the last option to create a new one. Click on *Create* in the task pane.
- The *New Address List* dialog box opens up for us to type in the details that will vary from one letter to another. This dialog box has various buttons that allow us to make *New Entry*, *Delete Entry*, *Find Entry*, view existing entries by moving to *First*, *Previous*, *Next* and *Last* entry.
- However, it will be very rare that all the fields (like *Title*, *First Name*, etc.) in the *New Address List* dialog box will match your requirement. There will be some we don't need, while there may be others which are not included. To modify the list of fields, click on *Customise*.
- The *Customise Address List* dialog box opens up. In this dialog box, we can add new fields, delete or rename existing fields, and also change the order in which the fields are arranged by using the *Move Up* or *Move Down* buttons.
- Since we want to send the letters to your friends, delete the unwanted fields – *Title*, *Company Name*, *Address Line 2*, *ZIP Code* (we don't have ZIP code in India, instead there is PIN Code), Country (no one is going to be invited from abroad) and *Work Phone* by selecting them one at a time and clicking on *Delete* button.

- We might also want to invite few of your teachers, but at a different time. So include *Time* as a field by clicking on *Add* and typing in the field name.
- On the screen is the *New Address list* dialog box with the modified field list. Type in the details of your friends; clicking on *New Entry* button after completing each receipient's details.
- Once we have completed entering the details of your invitee, click on *Close* button. We will be prompted to save the address list. Save it with an appropriate name – say *FriendsList*. The list is saved as a *Microsoft Access* database.
- We can now see the *Mail Merge Recipients* dialog box containing the details that we have just entered. If we don't want to send the invitation to one or more names in the list, just uncheck the boxes in front by clicking on them. Click on *OK*, once done.
- Click on *Next* on the task pane to proceed with mail merge. (There are opions like *Select a different list* and *Edit receipient list*). Try them.
- In the document that is open, type in the part of the letter which is common to all, like the text of your letter. Don't put in the name, address or time, since they will not be the same in every letter.



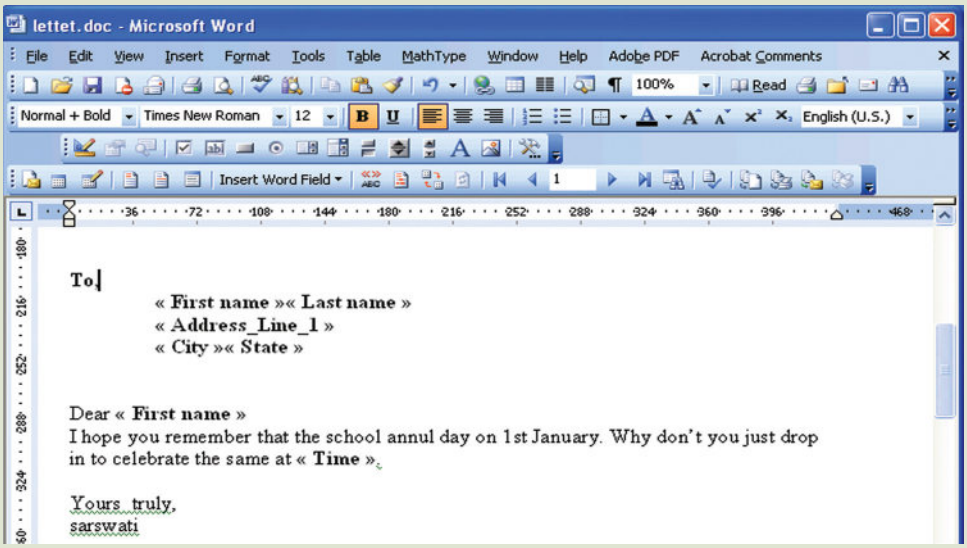


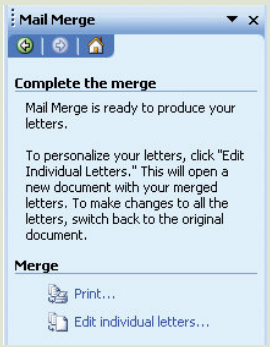




- The task pane provides assistance to include fields – the data which we had typed in earlier. We can put the insertion point in the beginning and click on *Address Block* to insert the formatted address. We can also click on *More items* to see all your fields, so that we can include the fields of your choice. The selected field will be inserted where the insertion point is placed.
- Put the insertion point at the beginning of the text. Click on *More items...* on the task pane, and enter the name and the various address fields. Then place the insertion point where we would like to put the time, and insert the *Time* field. If need be, we can format these fields.
- At this point, we will not see the data for the fields that we had typed in; instead we shall only see the field placeholders.
- Click on *Next* on the task pane to see what the actual letter would look like. In this view of the task pane, we have options to preview letter by clicking on <<

or [>>] buttons. We can also exclude certain receipients from your list by clicking on [Exclude this recipient] button. Click on *Next* to complete the merge process.

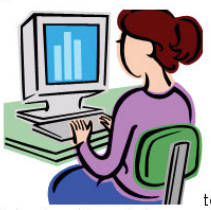


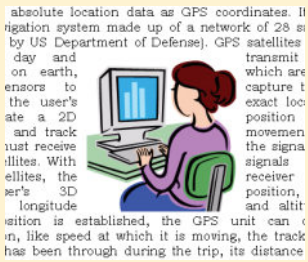
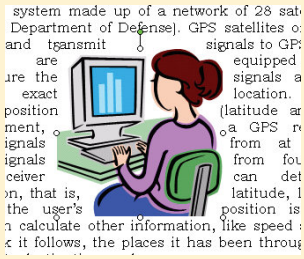
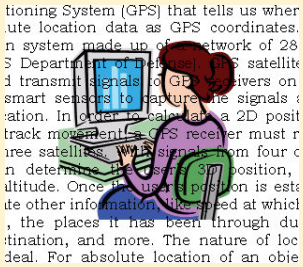
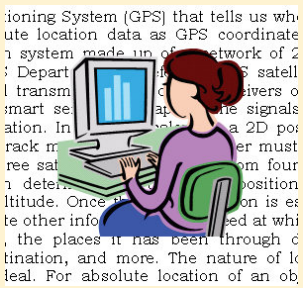


- In this task pane view, we can merge your document to the printer by clicking on *Print* – meaning that the letters will be printed one after another, containing the names, addresses, etc. that we had put in your address list. We can also merge to a new document by clicking on *Edit individual letters*. This will open a new document containing all your merged letters – if needed, we can then edit them one by one before printing.

In the above discussion, we learnt the *Mail Merge* utility using the task pane. However, when we proceed with mail merge, the Mail Merge Toolbar also appears with the required options. Try different tools available on the toolbar.

Appendix 3.3 : Text Wrapping Styles

Wrapping Style	Result
The *In line with text* style insets the graphic in the text at the location of the insertion point. The graphic moves as we add or delete text. The text does not wrap around the graphic; white space extends to the margins on either side of the graphic.	are used to locate objects of var location of an object is often dynar dynamic, the information changes inform  that tells us absolute location data as GPS navigation system made up of a netv

The *Square* style wraps the text around all sides of a square bounding the graphic.	
The *Tight* style wraps the text around the graphic in an irregular shape bounding the actual image. The graphic moves as we add or delete text.	
The *Behind text* style has no border around the graphic. The graphic floats on its own layer behind the text.	
Like the previous case, the *In front of text* style has no border around the graphic. But in this case, the graphic floats on its own layer in front of the text..	

Electronic Spreadsheet

4

Objectives

After completing this Chapter, the student will be able to:

- *create, save and open a sheet in a spreadsheet,*
- *enter data – text, numbers and formulas in a sheet,*
- *navigate within a sheet and also between different sheets of a workbook,*
- *insert and delete cells, rows and columns in a sheet,*
- *select, copy, paste and delete cell data within a worksheet,*
- *use various formulas and inbuilt functions provided in the spreadsheet,*
- *create error free sheets using special tools like spell check and auto correct,*
- *setup the page and margins of the worksheets so as to print it in a paper of desired choice,*
- *format the data in the worksheet entirely or selectively,*
- *define and apply styles and*
- *enhance worksheets using charts.*

"It's a humongous time saver! I did [depreciation calculations] with spreadsheets before, but because of tax laws changing so much, you have to keep track of ACE (adjusted current earnings), AMT (alternative minimum tax) and four or five other methods of reporting. And updating would take four or five hours. Now, with one button, the information just rolls over."

Terry Rogers
Consultant, Datacentrik Solutions, Vancouver.

Introduction

In our daily life, we may have come across a list of items in tabular form several times. For example, the shopping bills, the school annual report card, or the cricket match scorecard. These tables with rows and columns are called spreadsheets. If we have to tabulate and analyse the data for the Indian team's performance in a cricket series and submit a project as part of our course evaluation, we will perhaps take a chart paper and design the project, write a report and submit it. That's the way we have done it all along. The project may completely cover all aspects of the series but we are not happy with it. This is because the project report is static – we cannot make dynamic analysis using this paper report. How do we then get attention of our audience? Welcome to the world of electronic spreadsheets, where we can do all these, and much more. Let us see how.

4.1 A SPREADSHEET

A spreadsheet is defined as a large sheet which contains data and information arranged in rows and columns. There are different spreadsheet programs available; some are proprietary, like *Microsoft Excel, Lotus 123,* etc., others are free/open source like, *Gnome Office Spreadsheet Gnumeric, KOffice KSpread, OpenOffic.org Calc*. Spreadsheets, also known as worksheets, allow us to perform detailed analysis on numerical data. Data is entered in a cell, which represents the intersection of a row and a column. The most powerful feature of a spreadsheet is that it automatically recalculates the result of mathematical formulas if the source data changes. A spreadsheet can help us quickly record and manipulate a large amount of numerical information and share it with others in a wide variety of forms. Since MS-Excel, an integral component of MS-Office, is one of the programs which has all these features and many more we have taken it as a spreadsheet program.

4.2 STARTING A SPREADSHEET PROGRAM

To start follow the steps given below:

1. Click on 

button on the Taskbar.
2. Click on 

option in the pop-up window.
3. Click on 

A blank spreadsheet as shown in figure 4.1 is displayed.

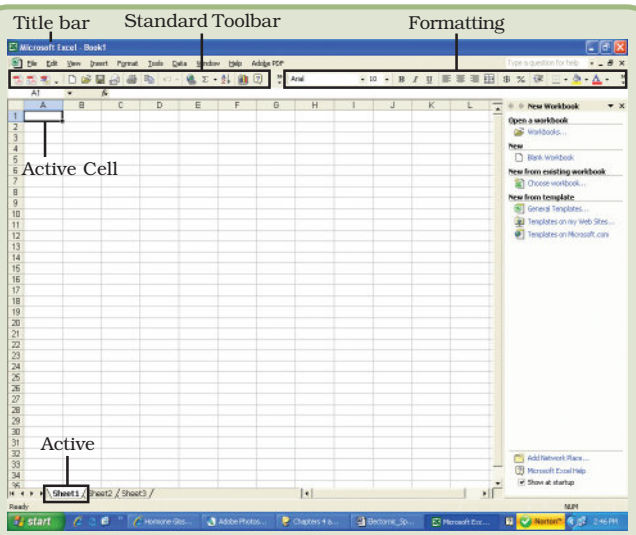


Figure 4.1 : A blank spreadsheet

4.3 BASIC SPREASDSHEET ELEMENTS

4.3.1 Workbook and Worksheet

Each speadsheet file is known as a workbook and is stored with a default extension of .xls. Each workbook can contain many sheets, so various kinds of related information can be organised in a single file. Each workbook can contain up to 255 worksheets, but by default it displays only three. Worksheet is the area where the data is stored and work is performed. Extra worksheets can be added as and when required.

4.3.2 Rows, Columns and Cells

The rows in a worksheet are numbered from top to bottom along the left column of the worksheet. The columns are labeled from left to right with letters. The total number of rows in Excel are 65536 and the

total number of columns are 256. Columns are named from A to IV. The rows are numbered from 1 to 65536.

A ***cell*** is the intersection of a row and a column. A cell is identified by an address that consists of the column name followed by the row number. For example, the first cell is referred to as A1, which indicates that it lies at the intersection of the column A and row 1. This is the active cell. The active cell is ready for accepting any action or input. A small group of ***contiguous cells*** is defined as a range. The range is referred to by writing the starting address of the cell in the range: Ending address of the cell in a range or vice versa. For example A1:A10 (can also be referred as A10 : A1).

4.4 NAVIGATING IN A WORKSHEET

The cursor keys, mouse and the scroll bar can be used to navigate through the worksheet. However, navigating through the 65,536 rows and 256 columns using these techniques is very inefficient. To move to any cell directly without scrolling through the entire worksheet, use any of the following shortcut methods:

Method 1 : Using key combinations

Movement	***Key Stroke***
One cell up	Up arrow key (↑)
One cell down	Down arrow key or ***ENTER*** (↓)
One cell left	Left arrow key (←)
One cell right	Right arrow key or ***TAB*** (→)
Top of the worksheet (cell A1)	***CTRL*** + ***HOME***
End of the worksheet (last cell containing data)	***CTRL*** + ***END***
End of the row	***CTRL*** + right arrow key or ***END*** + right arrow key
End of the column	***CTRL*** + down arrow key or ***END*** + down arrow key

Method 2 : Using the name box

1. Type the cell address in the Name Box
2. Press ENTER to reach the desired cell.

For example, to move to cell D6, enter D6 in the Name Box and press ENTER. The cursor is positioned on the cell in the D column and 6th row.

Method 3 : Using the go to dialog box

1. Press ***F5*** or ***CTRL + G*** or choose Go To option from the Edit menu to

invoke the Go To dialog box.
2. Enter the cell coordinates in the Reference textbox.
3. Click OK to move to the desired cell.

4.4.1 Navigating Between Worksheets

To move between worksheets, simply click on the sheet number in the lower left corner of the screen (Figure 4.2). In case the number of worksheets is more than the number which can be displayed use the tab scrolling buttons, located next to the sheet numbers and then click on the sheet number to select it.

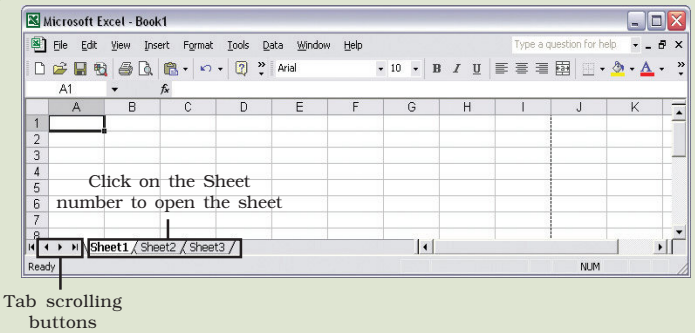


Figure 4.2 : Spreadsheet showing different worksheets

The tab scrolling buttons and their use are given below:

Icon	Movement
◀|	To display the first worksheet
▶|	To display the last worksheet
◀	To display adjacent worksheets on the left
▶	To display adjacent worksheets on the right

4.5 SAVING A WORKBOOK

To save a Workbook:

1. Choose the Save As option from the File menu or Click on the Save button on the Standard Toolbar or Close the workbook by clicking on the Close button. The Save As dialog box is displayed as shown in the figure.
2. Select the directory in which the file is to be saved.
3. Type the name of the file in the File Name text box.
4. Click Save.

4.6 OPENING A WORKBOOK

To open a workbook:

1. Choose Open option from the File menu or Click on the Open button on the Standard Toolbar.
2. Select directory in which the file has been saved.
3. Type the name of the file in the File Name field or select the name by clicking on it.
4. Click Open.

4.7 USING FORMULAS AND FUNCTIONS

Formulas are entries containing an equation that calculates the value to be displayed. Please remember, when working with formulas, *do not* type in the numbers but type in the equation. This equation will be automatically updated upon the change or entry of any data that is referenced in the equation.

4.7.1 Entering Formulas

Cells in a worksheet can also contain formulas that are helpful in performing calculations. Formulas are mathematical equations. They are useful for establishing the relationship between two or more cells. They contain the coordinates of the cells that are used in the formula, operators and functions. When a formula is entered, the cell displays the result of the formula. Formulas must begin with an = sign, otherwise it is treated as a text entry (Figure 4.3).

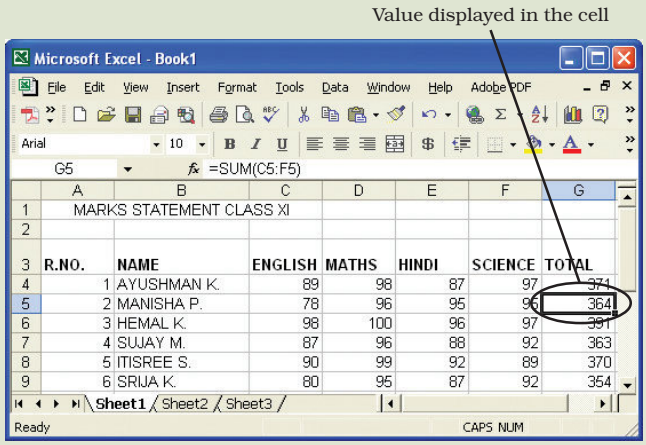


Figure 4.3 : Using formula in a Spreadsheet

Whenever any cell value is changed it automatically recalculates the values of any formula and displays it in the relevant cell.

Using Arithmetic Operators

When a number is entered into a cell, it is possible to perform mathematical calculations using them. Spreadsheets have many mathematical functions built into them. The most basic operations used widely are addition, subtraction, multiplication and division. Follow the given steps to perform addition.

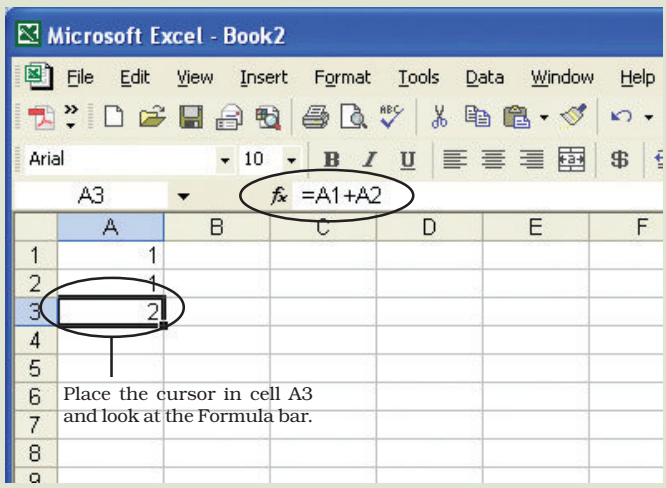


Figure 4.4 : Working with Math Function

1. Move the cursor to cell A1. Type 1.
2. Press Enter to move to cell A2. Type 1 in cell A2.
3. Press Enter to move to cell A3.
4. Type =A1+A2 in cell A3.

Note that the contents of cell A1 and A2 have been added and the result is shown in cell A3 (Figure 4.4).

The same steps can be followed to perform other mathematical operations by simply changing the formula typed into cell A3.

Using Auto Sum

The addition of numbers is one of the most frequently used actions. Thus, a toolbar button, AutoSum, has been provided to accomplish this task. The AutoSum button on the Standard toolbar automatically adds the values above the destination cell or to the left of the destination cell. The steps to illustrate this are as follows:

1. Click on the destination cell i.e. the cell in which the result is to be displayed.
2. Click on the AutoSum button, which is located on the Standard toolbar. The cells containing the numbers to be added automatically should now be highlighted.
3. Press Enter to see the result in the destination cell.

4.7.2 Functions

This has a set of prewritten formulas called functions. Functions are special programs that accept data and return a value after processing the data. Functions differ from regular formulas because they accept values and not the operators, such as +, -, *, or /. For example, the SUM function can be used to add numbers in place of the '+' operator. When using a function, remember the following :

- Use an equal to sign (=) to begin a formula.
- Specify the function name.
- Enclose arguments (data accepted by a function) within parentheses.
- Use a comma to separate arguments.

Some commonly used Functions are listed in Table representing some commonly used Functions (Appendix 4.1)

4.7.3 Copying and Pasting Formulas and Functions

Sometimes when working with formulas, the need arises to repeat the same formula for many different cells. The formulas can be copied using various methods.

Method 1 : Using the Edit menu

Steps are given below:

1. Click on the cell that contains the formula.
2. Choose the Copy option from the Edit menu.
3. Click on the cell where the formula is to be copied.
4. Choose the Paste option from the Edit menu. Note the change in the cell reference.
5. Press Esc to exit the Copy mode.

Method 2 : Using the Formatting Toolbar / Keyboard Shortcuts

Steps are given below :

1. Click on the cell that contains the formula.
2. Click on the Copy icon  located on the Formatting toolbar or press Ctrl + C keys.
3. Click on the cell where the formula is to be copied.
4. Click on the Paste icon  located on the Formatting toolbar or press Ctrl + V keys.
5. Press Esc to exit the Copy mode.

If a formula needs to be copied to multiple cells, use the AutoFill feature discussed later in the lesson.

4.7.4 Cell Referencing

Observe that when you copy and paste formulas, they are pasted relative to the position they are copied from. This is because of the way the formula treats the cell references. The cell coordinates in the formula are known as cell references. Two commonly used cell references are – Absolute and Relative.

Absolute Referencing

Absolute referencing implies that the coordinates of a cell are not changed when a formula is copied from one cell to another. To make a cell address an absolute cell address place a dollar sign in front of both the row and column identifiers. For example, A1 implies that both row and column have been fixed or made absolute. In simple words this means that while copying this formula to another cell, neither the column name nor the row number will change.

Relative Referencing

With relative cell referencing, when we copy a formula from one area of the worksheet to another, it records the position of the cell relative to the cell that originally contained the formula. This is the default mode of referencing in a spreadsheet.

The F4 key is used to toggle between the absolute and relative modes of referencing cells.

4.8 WORKING WITH WORKSHEET RANGES

Each cell is referred to by a cell address. A group of cells are referenced using a reference operator. There are two types of reference operators, range and union.

- A range reference refers to all the cells between and including the reference (Figure 4.5). A range reference consists of two cell addresses separated by a colon. The range reference B1:B4 includes cells B1, B2, B3 and B4. The range reference A1:B3 includes A1, A2, A3, B1, B2 and B3.
- A union reference includes two or more references. A union reference consists of two or more cell addresses separated by a comma. For example, the reference A1, B5, C7 refers to cells A1, B5, and C7. Similarly, the reference A1:A3,B4:B6 refers to cells A1, A2, A3, B4, B5 and B6.

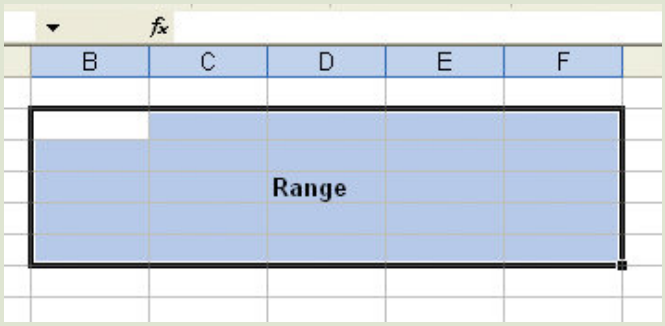


Figure 4.5 : Worksheet Range

4.8.1 Using Range Names in Formulas

When working with large volumes of data in a worksheet, it is frequently desirable to refer to a range of cells repeatedly. For example, if a column in the worksheet contains the price of products, it will be required again and again for calculating the total price of all products or calculating the average price and so on. In such a case, it is convenient and efficient to name this range meaningfully and use the name of the range instead of the cell coordinates. Naming a range of cells has the following advantages:

- Names are easier to remember than cell coordinates.
- Names make navigation in a worksheet easier.
- Named ranges can be used throughout a workbook easily. This is very helpful while linking worksheets in a workbook.

4.8.2 Creating Range Names

Steps to create a named range are:

1. Select the cell or range of cells to be named.
2. Choose the Name option from the Insert menu.
3. Choose the Define option from the Name sub-menu. The Define Name dialog box is displayed as in figure 4.6.
4. Type in the name of the range in the Names in a workbook text box.

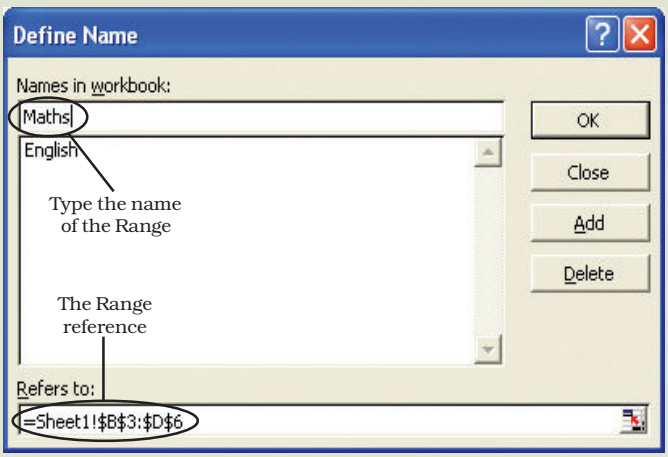


Figure 4.6 : To create Range Name from Name Option of the Insert Menu

5. Click on the Add button to create the name. The name is immediately added to the existing names in the box.
6. Click on the OK button to close the dialog box.

4.8.3 Using Range Names

Simply type the name in the formula in place of the cell coordinates. For example, to find the maximum of a range of marks named Maths, the formula will be =MAX(Maths).

4.9 WORKING WITH ROWS AND COLUMNS

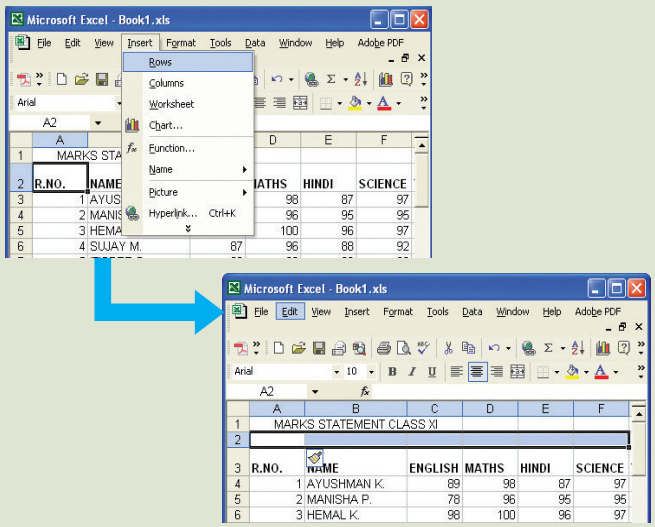


Figure 4.7 : Inserting a row

To add extra information to a worksheet, it may sometimes be desirable to insert new rows and columns. To insert a new row/ column, execute the following steps:

4.9.1 Inserting a Row

1. Click on the Row Number (or any cell in that row) above which the new row is to be added.
2. Choose the Rows option from the Insert menu. A row is inserted above the selected row (Figure 4.7).
3. Click any where in the spreadsheet to remove the selection.

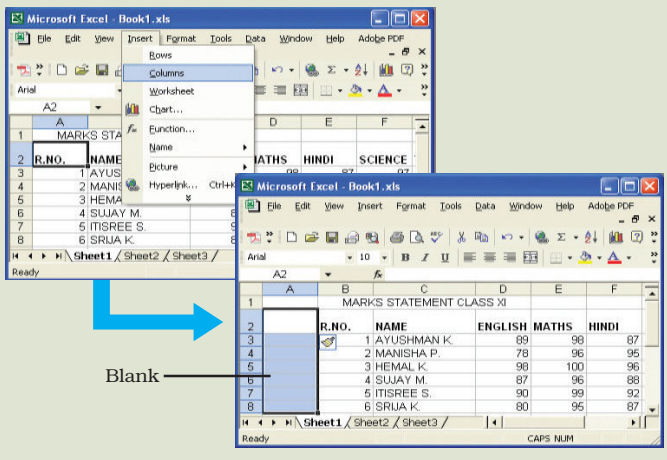


Figure 4.8 : Inserting a column

4.9.2 Inserting a Column

1. Click on the Column name (or any cell in that column).
2. Choose the Columns option from the Insert menu. A column is inserted to the left of the selected column (Figure 4.8).
3. Click anywhere in the spreadsheet to remove the selection.

4.9.3 Deleting Rows and Columns

When the contents of an entire row or column are to be deleted, perform the following steps:

1. Click on the Row Number/Column Name to be deleted.

2. Choose the Delete option from the Edit menu or right click and select Delete option from the pop-up menus.
3. Click anywhere in the spreadsheet to remove the selection.

4.9.4 Inserting and Deleting Cells

We can insert or delete individual cells also, rather than the entire row or column.

Inserting a Cell

1. Click on the cell where new cell(s) is to be inserted.
2. Choose the Cells option from the Insert menu. The Insert dialog box is displayed (Figure 4.9).
3. Choose the appropriate option. The result of each option is explained as under:

   (a) Shift cells right – adds a blank cell to the left of the selected cell.
   (b) Shift cells down – adds a blank cell above the selected cell.
   (c) Entire row – adds a new row above the selected cell.
   (d) Entire column – adds a new column to the left of the selected cell.

4. Click on OK button.

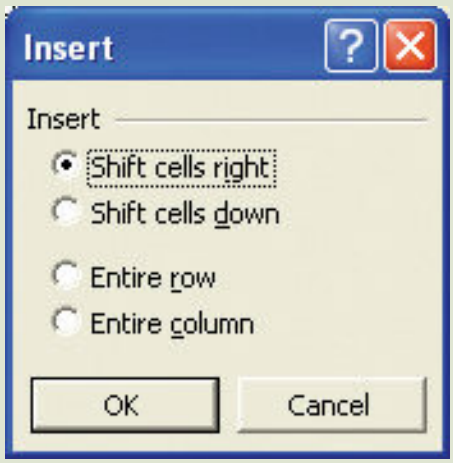


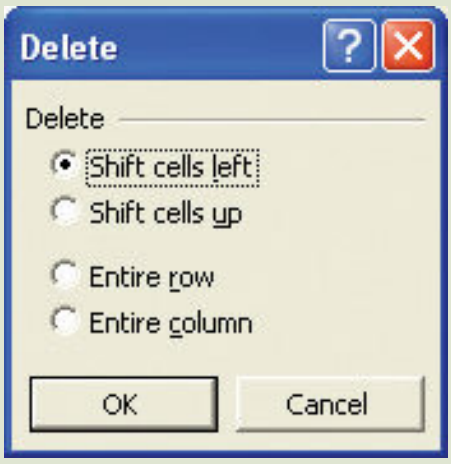
Figure 4.9 : Insert dialog box

Deleting a Cell

1. Click on the cell which is to be deleted.
2. Choose the Delete option from the Edit menu. The Delete dialog box is displayed as shown in figure 4.10.
3. Choose the appropriate option. The result of each option is explained as under:

   (a) Shift cells left – the cells to the right of the deleted cell are moved left.
   (b) Shift cells up – the cells below the deleted cell are moved up.
   (c) Entire row – deletes the entire row and moves the row below upwards.
   (d) Entire column – deletes the entire column and moves the row to the right leftwards.

4. Click on OK button.



Fiugre 4.10 : Delete dialog box

Note: If there is any data at the extreme right or at the end of the worksheet, it does not allow us to insert cells or rows. This is because, it does not delete existing contents from the worksheet while inserting cells. For example, if there is data in row number 16,384, then inserting a row will result in an error.

4.9.5 Clearing Data

To delete an entry in a cell or a group of cells, place the cursor in the cell or highlight the group of cells and press the Delete key. Note that this method only clears the cell contents and not the cell formats or comments.

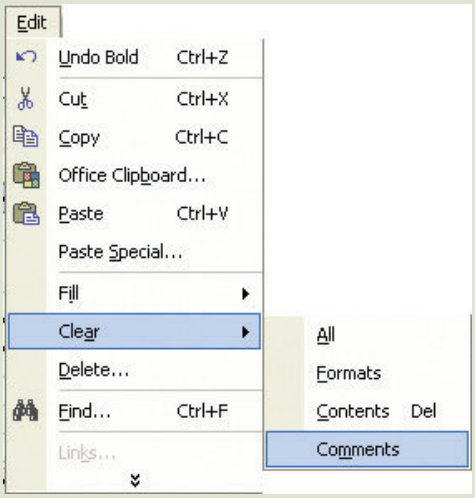


Figure 4.11 : Clear data using Edit Menu

Alternatively, use the Edit menu that allows an option of what to delete.

Steps for clearing data using Edit menu are as under:

1. Click on the cell or select the cell range whose contents are to be deleted.
2. Choose the Clear option from the Edit menu.
3. Choose the relevant option from the Clear sub-menu.

The Clear sub-menu offers four choices (Figure 4.11) explained as below:

- All – to delete all formats, contents and comments.
- Formats – to delete formats only.
- Contents – to delete contents only.
- Comments – to delete comments only.

4.10 SELECTING CELLS

To perform a function on any particular cell or a group of cells, the cell or cells need to be first selected. Selecting a single cell is as simple as clicking on it.

4.10.1 Select a Row

To select an entire row, click on the row number to be selected on the left hand side of the spreadsheet.

4.10.2 Select a Column

To select an entire column, click on the column label at the top of the spreadsheet.

4.10.3 Select all Cells in a Worksheet

Click on the empty grey box in the left corner between A and 1. This area is called the Select All button.

4.10.4 To Select a Contiguous Group of Cells

To select adjacent cells, use any of the following methods.

Method 1 : Using the Name Box

1. Click on the Name Box.
2. Type the cell reference of the starting cell and the ending cell separated by a colon in the Name Box. For example, to select cells A3 to A10, type A3:A10 in the Name Box.
3. Press Enter to select the cells.

For example, as shown in the figure 4.12, typing A1:D1 in the Name Box selects the cells in the specified range i.e. A1,B1,C1,D1.

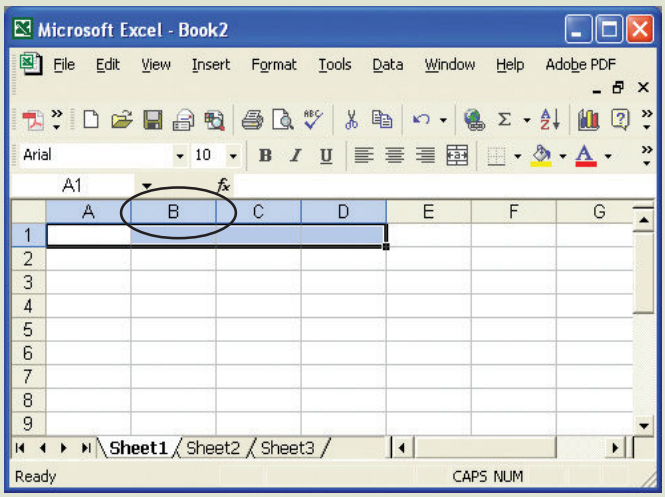


Figure 4.12 : Selecting Contiguous Group of Cells using Name Box

Method 2 : By Dragging

1. Place the cursor in the starting cell.
2. Holding down the left mouse button, ***drag*** the mouse over the area which is to be selected.

4.10.5 To Select Non–continuous Group of Cells

1. Place the cursor in cell A1.
2. Press the left mouse button.
3. While holding down the CTRL key and left mouse button, move mouse from starting cell to ending cell. Holding down the Ctrl key enables one to select non–contiguous areas of the worksheet.
4. Perform the desired operation or Press Esc and click anywhere on the worksheet to remove the highlighting.

4.11 EDITING CELL CONTENTS

After entering data into a cell, changes can be made to it using any of the following methods:

Method 1 : Using the F2 Key

1. Move the cursor to the desired cell whose contents have to be edited.
2. Press F2. Make the necessary changes.
3. Press Enter.

Method 2 : Using the Formula Bar

1. Move the cursor to the desired cell whose contents have to be edited.
2. Click in the formula area of the Formula Bar. (Figure 4.13)

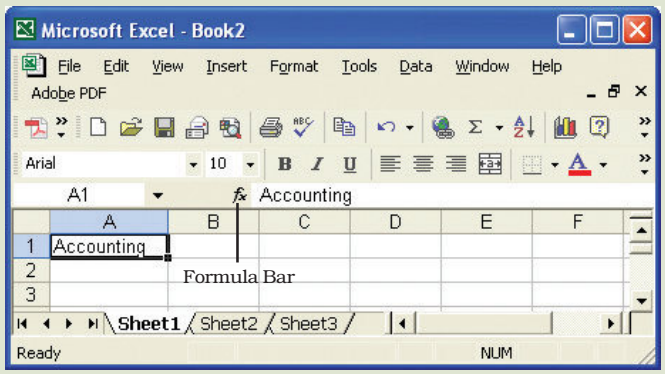


Figure 4.13 : Editing Cell Content

3. Make the necessary changes.
4. Press Enter.

Method 3 : Double-click in the Cell

1. Move the cursor to the desired cell whose contents have to be edited.
2. Double-click in the cell.
3. Make the necessary changes.
4. Press Enter.

4.12 FORMATTING WORKSHEETS

4.12.1 Aligning Cell Content

By default, text entries are left aligned and formulas and numbers are also left aligned. These alignments can be changed. Apart from the Left, Right and Center alignment options, the entries can be aligned vertically also. There are two methods for changing the horizontal cell alignment as explained below.

Method 1 : Using the Menu

1. Click on the cell to be aligned.
2. Choose the Cell option from the Format menu. The Format cells dialog box appears.
3. Choose the alignment tab.
4. Click to open the drop-down box associated with the horizontal field. After the drop-down box is opened, select the desired alignment as Right, Left or Center.
5. Click OK to close the dialog box.

Method 2 : Using the Format Toolbar

1. Click on the cell to be aligned.
2. Click on the appropriate alignment button in the Format toolbar to change the alignment.

Icon	Effect
	Left aligns the selected text
	Centers the selected text
	Right aligns the selected text

To change the vertical alignment select the desired alignment as Center or Bottom from the Vertical drop-down box in the Format Cells dialog box displayed above.

Note : To make the line of data fit evenly within the height of a cell, choose the justify option.

4.12.2 Changing Column Width

There are two methods to change the column width.

Method 1 : Using the Menu Bar

1. Place the cursor anywhere in the column whose width is to be changed.
2. Choose the Column option from the Format menu. A dialog box opens.
3. Type in the required Column width in the dialog box and click on OK.

Method 2 : By Dragging

1. Place the cursor on the line between the B and C column headings. The cursor with two arrows appears.
2. Move the mouse to the right while holding down the left mouse button. The width indicator appears on the screen.
3. Release the left mouse button when the width indicator shows the desired width.

4.12.3 Changing Row Height

There are two methods to change the row height.

Method 1 : Using the Menubar

1. Place the cursor anywhere in the row whose height is to be changed.
2. Choose the Row option from the Format menu. A dialog box opens.
3. Type in the required Row Height in the dialog box and click on OK.

Method 2 : By Dragging

1. Place the cursor on the line between the 1 and 2 row headings. The cursor should look like the one displayed above, with two arrows.
2. Move the mouse downwards or upwards while holding down the left mouse button. The height indicator appears on the screen.
3. Release the left mouse button when the height indicator shows the desired height.

4.12.4 Changing Font Attributes

The Font style, size and colour can be easily changed in a spreadsheet to dress it up a little. To set the Font properties perform the following steps.

1. Click on the cell whose font properties are to be changed.
2. Choose the Cell option from the Format menu. The Format cells dialog box appears.
3. Choose the Font tab.
4. Change the Font type, style, size and colour using the appropriate options.
5. Click on OK.

Alternatively use the formatting tools available on the Formatting tool bar for changing the type, size and colour of the text.

4.12.5 Making Format Changes

Auto Formatting Worksheets

The ***Auto Format*** is a tool for creating pleasing worksheets with various formats quickly and easily. To Auto format a worksheet, follow the given steps:

1. Choose the Auto Format option from the Format menu.
2. Select the format to apply.
3. Click on OK.

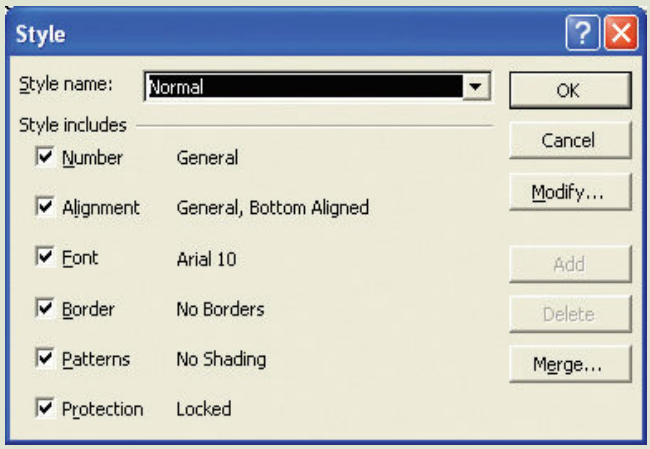


Figure 4.14 : Style option dialog box

Modifying Styles

The worksheet allows users to create, store and use individual formatting styles. A style can be defined as a collection of formats such as font size, patterns, and alignment that can be defined and saved as a group. To add or modify styles perform the following steps :

1. Choose Style option from the Format menu.
2. In the Style name box, type a name for a new style (Figure 4.14).
3. To change formats for an existing style, click the style you want to change.
4. Click Modify.
5. On any of the tabs in the dialog box, select the formats you want, and then click OK.
6. Clear the check box for any type of formats that are not to be included in the style.
7. To define and apply the style to the selected cells, click OK.
8. To define the style without applying it, click Add, and then click Close.

Additional Formatting Options

Special Cell Borders

Another formatting feature, which can improve the readability of a spreadsheet, is to add borders around cells. This is especially useful if spreadsheet needs to be printed, because, by default, the light grey cell gridlines don't appear when a spreadsheet document is printed.

To set borders, the steps are:

1. First select the cells on which you want to put borders.

2. Then click the Borders button on the toolbar at the top of the screen .
3. Select a border style from the options that are displayed in figure 4.15. In the example below, the All Borders options is selected – this places a single line around all sides of all of the selected cells.



Figure 4.15 : Choose Border Options

It is also possible to give different borders on different sides of a cell or have coloured borders around cells. Use the Draw borders option for this purpose. For this, follow the given steps:

1. Click on the down arrow next to the borders button on the formatting Toolbar.
2. Select the Draw Borders option from the drop-down menu. The Borders toolbar is displayed as shown in figure 4.16.
3. Choose the colour of the border and the type of the border and draw borders or grids.

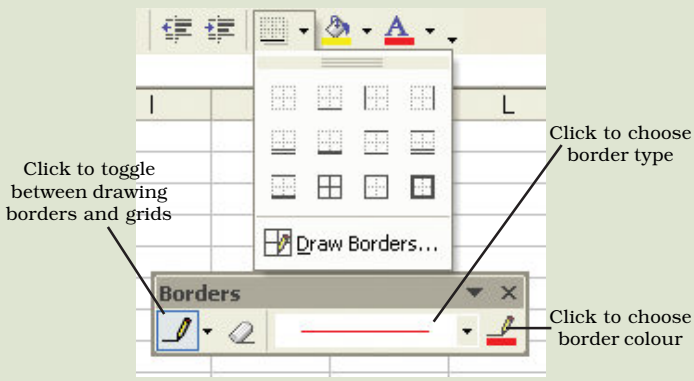


Figure 4.16 : Draw Border Options

Special Cell Shades

Cells can be filled with various colours or shading effects. For achieving this, use the Patterns tab of the Format cells menu. The steps to be followed are given below:

1. Select the cells to which cell shading is to be applied.
2. Choose the Cells option from the Format menu.
3. Click on the Patterns tab.
4. Choose the desired colour and/ or pattern from the available list.
5. Click on OK.



Figure 4.17 : Format cell window for protecting cells

Protecting Cells

It allows us to set Protection options to prevent editing (or even viewing) of all or parts of a workbook. This can be very useful while sharing a spreadsheet with others or even to prevent accidental altering of labels and formulas once they are all completed.

It is necessary to set an option to unlock cells that may still require change after a worksheet is protected. By default every cell has its Locked property set to true. For unlocking cells :

1. Select the block of cells to be unlocked.

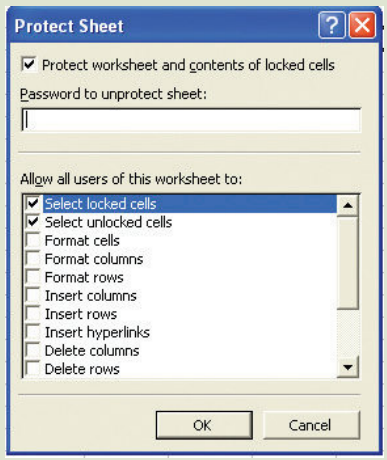


Figure 4.18: Protect sheet dialog box

2. Choose the Cells option from the Format menu. The Format Cells window appears as shown in figure 4.18.
3. Click on the Protection tab.
4. Click in the box next to Locked to remove the check mark.
5. Click OK. The Locked property for these cells is now disabled.

Conditional Formatting

This feature allows the user to apply formats to cells that satisfy a predefined criterion. To apply conditional formatting, perform the following steps:

1. Choose Conditional Formatting option from the Format menu.
2. In the Conditional Formatting dialog box (Figure 4.19) specify criteria using the various options.

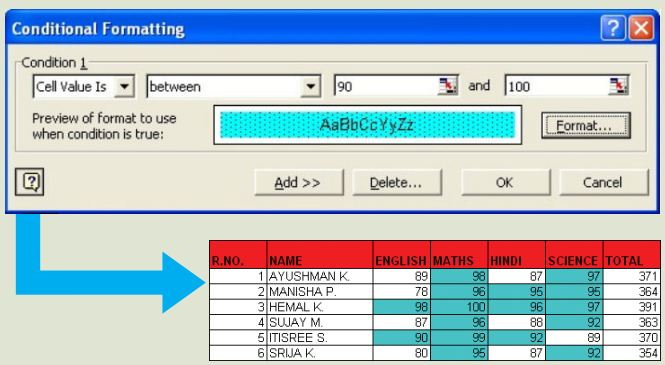


Figure 4.19 : Conditional formatting dialog box

3. Click Format.
4. Select the font styles, borders, shading and other options to be applied.
5. Click OK to apply the formats to cells that meet the specified criterion.

Tab Colours

To separate out worksheets from one another, it is possible to give different colours to the name of the worksheets at the bottom left corner. The steps to be followed for achieving this are:

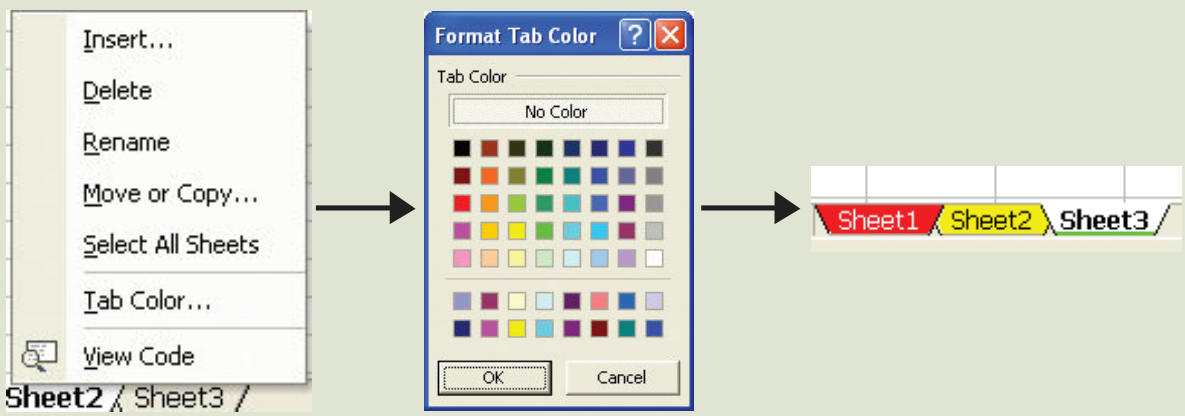


Figure 4.20 : Applying different colours to different sheets using Format Tab Color

1. Click on the Sheet name.
2. Right click and in the pop up box choose the Tab Color option.
3. Select the desired colour from the Format Tab Color Dialog Box as shown in figure 4.20.
4. Click on OK to see the effect.

4.12.6 Using Charts

Charts are an excellent tool to present data in a worksheet in a visually appealing format which aids in analysing and comparing data. The Chart Wizard button  guides through the steps for creating an embedded chart. The steps are as follows:

1. Highlight all the cells that need to be included in the chart including headers.
2. Choose the *Chart* option from the Insert menu.
3. Choose the suitable *Chart* type from any of the available types. We will select Column. There are various types available like Pie Chart, Bar Chart, Line Chart, etc.
4. In the Chart Sub-type box, choose the Clustered Column icon to select the chart sub-type.
5. Click Next.
6. The next step displays the address of the cell range selected for preparing the chart. If the need arises, this range can be changed by clicking on the collapse dialog box.
7. Click Next.
8. To place the Subject data on the x-axis, select the Rows radio button.
9. Click Next.
10. Type Class XI Performance in the Chart Title textbox.
11. Type Subjects in the Category (X) Axis field. Subjects will appear as the x-axis title.
12. Type Marks in the Value (Y) Axis field. Marks will appear as the y-axis title.
13. Choose the Data Table tab.
14. Select Show Data Table if required.
15. Click Next.
16. Choose the As Object in Sheet1 option to make the chart an embedded object and part of the current worksheet. In case we need it on a new sheet, then we may choose the option As New Sheet.
17. Click Finish.

Activity

Let us explore it by ourselves creating a worksheet and using different Chart Options.

4.12.7 Using Special Tools

Spell Checking

The Spell Check feature of spreadsheet is same as that for Word Processing which we used in the previous chapter.

1. Select the range of cells to be checked.
2. Click on Spelling button on the Standard Toolbar.
3. On locating an error, make changes accordingly.

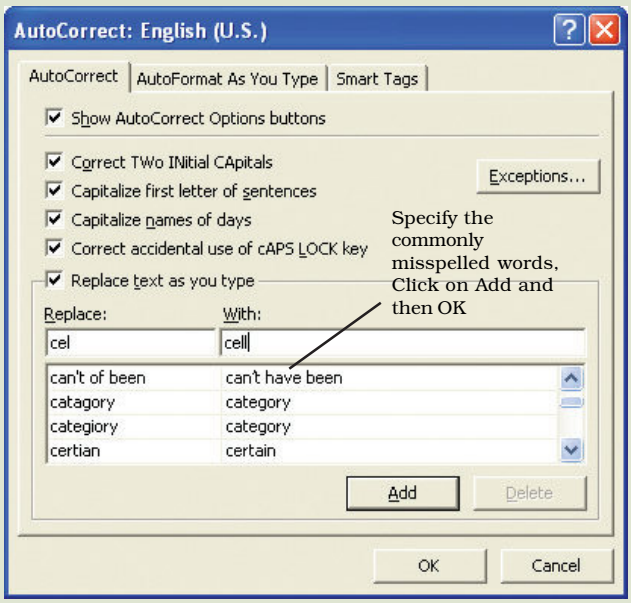


Figure 4.21: AutoCorrect Dialog Box

AutoCorrect Worksheets

The AutoCorrect feature can correct common typing errors during working. For example, it can change "adn" to "and" and change "their is" to "there is." The commonly misspelt words can be added as an AutoCorrect entry (Figure 4.21). The common misspelling is then automatically corrected.

4.12.8 Finding and Replacing Data

This feature is useful in finding and replacing multiple occurrences of a value in the worksheet quickly and efficiently. The steps involved are as given below:

1. Click on the cell whose value is to be found and replaced.
2. Choose the Replace option from the Edit menu. The Find & Replace menu box opens (Figure 4.22).
3. Enter the text to be found in the Find What textbox.
4. Enter the text to be replaced with in the Replace With textbox.
5. Click on the Replace All button and then Click on OK when prompted.
6. Click on Close to come out of the dialog box.

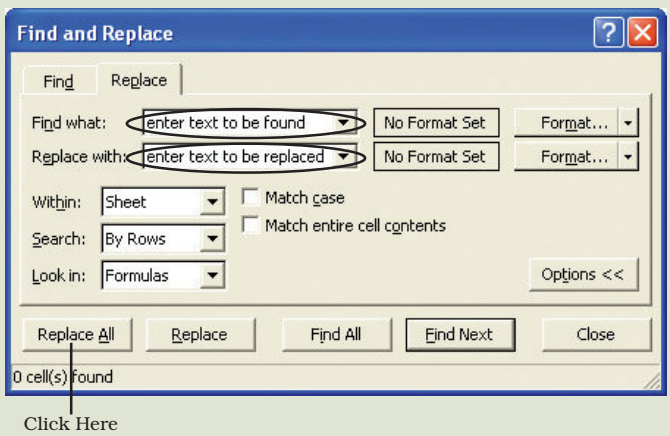


Figure 4.22 : Find and Replace Dialog Box

4.12.9 Using AutoFill

Excel contains a feature called AutoFill, which copies a logical series of values, labels or formulas. The AutoFill handle, which is like the "+" mathematical operator, can be located at the bottom right corner of the active cell.

To fill series perform the following steps:

1. Click on the first cell and type in "01-May".
2. Click on the cell again and then position the mouse in the bottom right of the cell so that the cursor turns to a small black plus sign, as shown below.
3. With the cursor, click, hold and drag the mouse down.
4. It automatically copies the date and increments by one day for each cell going down, giving the series 1-May, 2-May, ... , 10-May. It keeps showing exactly which day is being filled. Release the mouse when the desired date is reached (Figure 4.23).

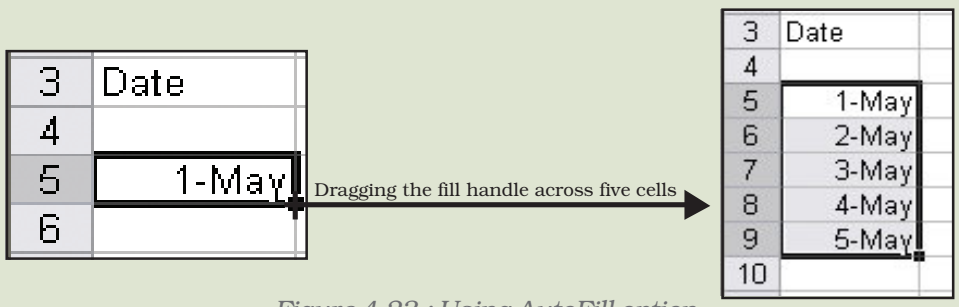


Figure 4.23 : Using AutoFill option

Note : Advanced options on creating such auto-fill series are available with the menu command Edit > Fill > Series.

4.12.10 Adding Comments

Cell comments are additional explanatory notes which can be attached to a cell in a spreadsheet.

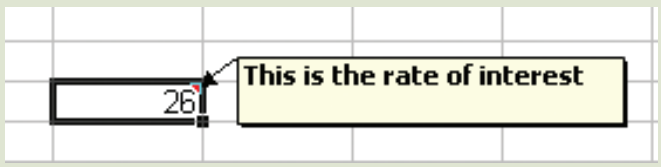


Figure 4.24 : Adding Comments

Cell comments are indicated by the small red triangle in the upper right corner of the cell. To view the comment, rest the pointer over the cell. A text box will appear, as shown in the figure 4.24.

To add a comment to a cell follow the given steps:

1. Click on the cell to which the comment is to be added.
2. Choose Comment from the Insert menu.
3. In the box, type the comment text.
4. Once the comment is typed, click outside the comment box. The comment disappears but a small red triangle appears at the top right corner of the cell.

To edit an existing cell comment, follow the given steps:

1. Click on the cell with the comment we want to edit.
2. On the Insert menu, click Edit Comment.
3. Edit the comment and click outside the comment box.

4.13 PRINTING A WORKSHEET/WORKBOOK

The simplest way to print a workbook is to click the Print icon located on the Standard toolbar. Dotted lines will appear on the screen after clicking on the print icon. These dotted lines indicate the right, left, top, and bottom edges of the printed pages. Before the printing can be done, it offers a variety of options to customise the printing according to specific needs.

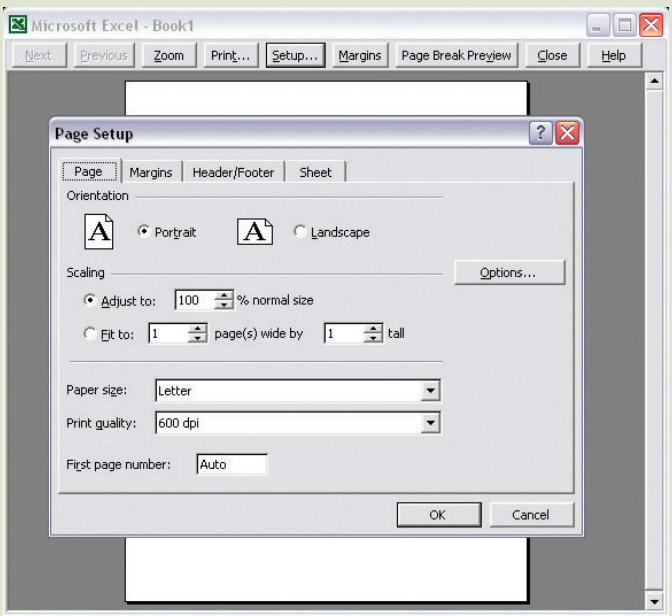


Figure 4.25 : Preparing a worksheet for printing

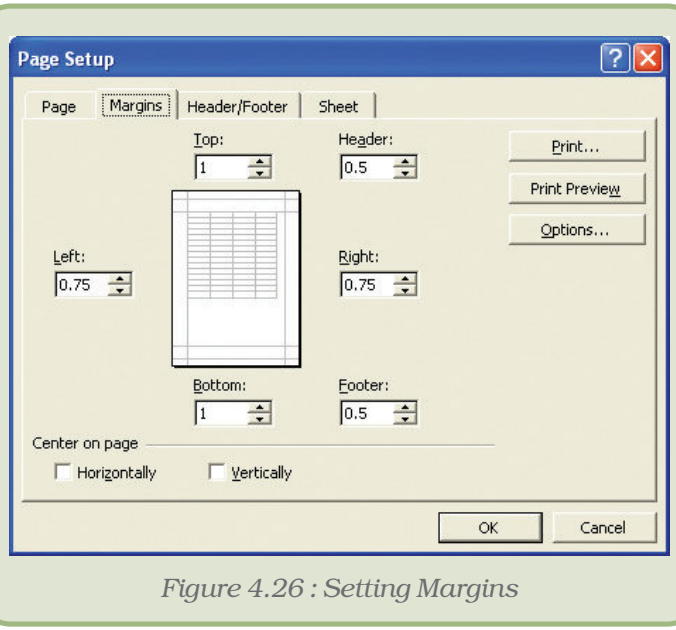


Figure 4.26 : Setting Margins

4.13.1 Print Preview

There are many print options. All Office packages offer a facility of previewing a worksheet before it is actually printed in order to customise the print according to one's specific requirements. Print options can be selected using the Page Setup dialog box or in the Print Preview. In Print Preview, it is possible to see the results of selections onscreen.

4.13.2 Print a Spreadsheet

To print a spreadsheet:

1. Choose Print Preview option from the File menu or click on the Print icon in the Standard toolbar.
2. Click Setup.
3. Choose the Page tab (Figure 4.25).
4. Choose Portrait or Landscape.
5. In the Adjust To field, type 100% to set the size to 100%.
6. Choose the Margin tab.
7. Check the Horizontally box in the Center On Page frame to center the spreadsheet horizontally.
8. Click OK.
9. Click Print. The Print dialog box opens.
10. Click OK to print the file.

Summary

- A spreadsheet, also known as a worksheet, is a row and column arrangement of data and the formulas to manipulate the data.
- A spreadsheet can be used for a variety of applications like business forecasts, inventory control and accounting.
- Every Excel file is a workbook that can contain more than one worksheet.
- Cell is defined as the space where a specified row and a column intersect.
- Worksheets can contain labels, numbers or formulas.
- Worksheet allows selecting both contiguous and non-contiguous cells.
- A range is a group of cells referenced with a name. The range reference consists of the first and last cell addresses separated by a colon.
- The AutoSum button on the Standard toolbar adds numbers automatically and also suggests the range of numbers to be added.
- Formulas and functions are automatically updated with a change in the source cell or position of the formula.
- In Relative referencing, the reference is adjusted relative to the new location of the formula.
- In Absolute referencing, the cell reference does not change but remains fixed while pasting formulas.
- Functions are pre-written formulas which must begin with an "=" sign.
- Cell ranges can be named and used in place of cell references.
- The AutoFill handle is a very useful tool to fill in logical series.
- Cell comments are additional explanatory notes which can be attached to a cell in a spreadsheet.
- Charts are an excellent tool to present data graphically and also help in analysing and comparing data.
- The most powerful feature of a spreadsheet package is the "What-if analysis". Using this feature, we can change values and immediately see the effect as the entire worksheet is automatically updated, based on the change in the values.

EXERCISE

Short Answer Type Questions

1. Define spreadsheet. Name any two spreadsheet software.
2. How many rows and columns are there in MS Excel?
3. How can you write a formula in Excel? Write a valid formula.
4. What is the shortcut to print current time in a cell?

5. Create a table to summarise the alignments of different types of datatype.
6. What is the use of auto correct option?
7. What is the use of print preview feature?
8. What is the use of auto sum feature?
9. How many function categories and functions are there in Excel? What do you understand by automatic recalculation feature of a spreadsheet?
10. Differentiate between relative and absolute cell referencing with the help of suitable examples.
11. Explain the uses of any two inbuilt mathematical functions in Excel.
12. Differentiate between the COUNT( ) and COUNTA( ) functions of Excel.
13. What is the function of the auto fill handle in Excel?

Long Answer Type Questions

1. What do you mean by conditional formatting? Explain.
2. Explain any five types of charts in Excel.

Multiple Choice Questions

1. A range refers to a _____ of cells.
   (i) Row
   (ii) Column
   (iii) Group of contiguous cells
   (iv) Group of non-contiguous cells
2. In _____ referencing, the cell reference does not change while copying formulas.
   (i) Relative referencing
   (ii) Absolute referencing
   (iii) Mixed referencing
   (iv) None of the above
3. Which of the following function keys is used as a toggle key for changing referencing modes?
   (i) F2
   (ii) F8
   (iii) F4
   (iv) F6
4. Which one of the following is the default folder for saving the files?
   (i) c:\
   (ii) d:\
   (iii) my documents
   (iv) new folder
5. A valid formula in Excel begins with:
   (i) +
   (ii) –
   (iii) #
   (iv) =

6. How many sheets are there in a workbook by default:
   (i) 1
   (ii) 2
   (iii) 3
   (iv) 4

7. Which function key is used to edit cell contents:
   (i) F1
   (ii) F2
   (iii) F3
   (iv) F4

8. Height of a row in Excel is:
   (i) 12
   (ii) 12.25
   (iii) 12.50
   (iv) 12.75.

Activities

Activity 4.1

Prepare an analytical result report of Second Monday Test Round Exam of your class in the format given below.

	A	B	C	D	E	F	G	H
1	1ST QUARTERLY CYCLE TEST							
2								
3	Name	English	Maths	Science	S. Science	Computer	Lang II	Total Marks
4	Ankit	78	65	77	88	76	54	
5	Achala	77	98	90	66	99	76	
6	Himanshu	67	78	87	56	84	92	
7	Paarth	81	91	98	77	100	78	
8	Total Appeared							
10	Highest M.							
11	Lowest M.							

Instructions

- Calculate the total marks obtained by each student in column I.
- Calculate the highest and lowest marks obtained in each subject in row 9 and 10 respectively.
- Also calculate the aggregate/percentage marks obtained by each student in column J
- Give the number of students appearing for each subject in row11.
- Find the subject-wise average marks and display them in the row 8.

ACTIVITY 4.2

Prepare a score sheet of an inter-house cricket match in your school:

A	B	C	D	E	
India vs. Pakistan					
Batsman	Balls Faced	Fours	Sixes	Singles	Total
Gurman Singh	61	7	3	23	
Harinder Singh	12	2	4	2	
Sachin Gupta	132	21	10	64	
Gaurav Sachdeva	17	4	5	7	
Ishwaq Ahmed	23	3	3	6	

Instructions

- Calculate the total runs obtained by each student in column E.
  (Total = No. of sixes x 6 + No. of fours x 4 + No. of Singles)
- Calculate the Strike Rate of each batsman in column F.
- Draw the pie chart to compare the strike rate of each batsman.

ACTIVITY 4.3

Prepare a personal expenditure report of last financial year in the format as below.

	A	B	C	D	E	F	G
1	Pocket -Money Expenditure Report 2008-09						
2							
3	Month	Mobile	Travel	Hobby	Dinner Dates	Savings	Total
4	April	1200	900	500	1000		
5	May	1440	788	700	1500		
6	June	1320	1110	700	1200		
7							
8							
9							

Instructions

- Assume that you are given a monthly pocket-money of Rs. 6000.
- Calculate the savings made by you every month.
- Calculate the total expenditure in each month.
- Calculate the highest and lowest expenditure made.
- Calculate the total savings after the three months
- Draw the bar graph to compare the expenditure of various months.

Activity 4.4

Prepare a report on purchase and sale of any 10 items of a shop over a week depicting the profit/loss in the format specified below.

Our School Canteen

	A	B	C	D	E
1	Weekly Purchase/Sale Report of Items				
2		Weekly Investment		Weekly Sale	
3	Item Name	Qty. Made	Cost Price (Rs.)	Qty. Sold	Selling Price (Rs.)
4	Samosa	250	2	245	3
5	Sandwitch	150	4	139	5
6	Fried Rice	300	7	300	10
7	Tea	225	2	225	3

Instructions

- Calculate the total amount invested on each of the items. Total Amount Invested=Qty. Purchased * Cost price.
- Calculate the total selling price of each of the items. Total Selling Price=Qty. Sold * Selling Price.
- Calculate the Profit/Loss of each of the items. Profit/Loss =Total Selling Price-Total Amount Invested.
- Calculate the overall Profit/Loss made by Our School Canteen.

APPENDIX

Appendix 4.1 : Annexure – Table Representing Some Commonly Used Functions

Function	*Description*	*Syntax*
SUM()	The SUM function is used to calculate the sum of the numbers passed as arguments.	=SUM(number1, number2, …….)
Average()	The AVERAGE function is used to calculate the average of the numbers passed as arguments.	=AVERAGE(number1,number2……..)
MAX()	The MAX function returns the largest value among the values passed as arguments.	= MAX(number1, number2, …….)
MIN()	The MIN function returns the smallest value among the values passed as arguments.	= MIN(number1, number2, …….)
COUNT()	The COUNT function is used to count the number of cells that contain numbers within the list of arguments.	= COUNT(value1,value2……..)
COUNTA()	The COUNTA function is used to count the number of cells that contain data within the list of arguments.	= COUNTA(value1,value2……..)
COUNTIF()	The COUNTIF function is used to count the number of cells within a range that meet the given criteria.	= COUNTIF(range, criteria)

Electronic Presentation Tool

5

Objectives

After completing this Chapter, the student will be able to:

- *design different types of slides,*
- *recognise type of views of presentation,*
- *insert graphics, audio and video in a presentation,*
- *copy and move text and slides within and between presentation files,*
- *apply designs in slides, adding animation effects to the text,*
- *add slide transition effects, and hyper linking,*
- *create action buttons,*
- *run a slide show and*
- *pack a presentation file to run it on a computer not having the presentation software.*

"Projected slides should be as visual as possible and support your points quickly, efficiently and powerfully."

Garr Reynolds

(Associate Professor of Management at Kansai Gaidai University)

Introduction

For our school exhibition, we want to prepare an exhibit on any current issue – global warming, drug abuse or child labour. We could prepare our exhibit in the conventional way, i.e. by using static tools, like charts and posters and maybe some visual images. Imagine the impact if, instead of the charts, we have music, moving objects and graphics displaying the message.

The objective of the exhibition is to make our message understood and remembered by others. An average human being has a very short attention span. Audio-visual aids can make presentations more interesting, dynamic and effective. Therefore, we can make it more interesting and attention seeking by making the characters move/dance, use pictures/charts/graphics, play music or show video. Thus we manage to create a much better impression. How can we do this?

5.1 AN ELECTRONIC PRESENTATION

An electronic presentation program is used to display information. This information is normally displayed in the form of a slide show – the information is shown on a slide which is viewed on a computer's monitor, or beamed on a screen using a LCD projector. A presentation can have several slides, which can be displayed one after the other. The information presented can be an assortment of text, graphics, audio and video.

Why do we call the screen of information a *slide*? The word *slide* is a reference to the slide projector, which is somewhat obsolete today, thanks to electronic presentation software. In the days of slide projectors, each slide had to be shot by a camera, specially developed in a studio, and then placed on a slide projector for projection on a screen. Today, however, we can just design our slide on a computer using a presentation software and project it.

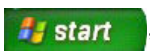
There are different types of presentations like professional (work-related), educational and for general communication. Presentation programs can either supplement or replace the use of older visual aid technology, such as pamphlets, handouts, chalkboards, flip charts, posters, slides and overhead transparencies.

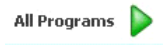
A commonly used presentation program is Microsoft PowerPoint, although there are alternatives such as OpenOffice.org, Impress, Corel Presentations and Apple's Keynote. A presentation program includes three major components: an editor that allows text to be inserted and formatted; a method for inserting graphic images, audio and video; and a slide-show system to display the final content.

In this chapter, we are using the presentation package – Microsoft PowerPoint – as our learning tool. However, we should remember that other such programs are also available. If we learn to use one of them, we will be able to use the others without any difficulty.

5.2 STARTING THE PRESENTATION PROGRAM

Whatever the presentation program we are using, we can start it from the *Program* option under the *Windows Start menu*. For example, to start Microsoft PowerPoint, click on

- 

, then on
- 

, and lastly on
- 

5.2.1 Anatomy of the Application Window

Any presentation software that we use will allow us to design and show slides. The application window (i.e., Microsoft PowerPoint window, Openoffice.org

Impress window, etc.) will provide us with tools that will assist us in our job (Figure 5.1). The important components of this window are:

- **Menu Bar :** Provides menu options to help in designing and viewing the presentation.
- **Standard Toolbar :** Contains tools for standard tasks, like saving, printing, cutting, copying, pasting, etc.
- **Formatting Toolbar :** Provides tools for formatting like bold, italic, underline, etc.
- **Task Pane :** Allows options depending on the selected task. The figure 5.1 shows the options for the task *New Presentation*. We can select other tasks too.
- **Slide Pane :** This is the place where we design the slide by typing, formatting, etc.
- **Slide Sorter Pane :** Allows us to decide on the order in which the slides will be shown during the slide show.
- **Notes Pane :** Allows us to type in notes that we may need while preparing for the presentation later, but will not be shown during the slide show.
- **View Buttons :** Provides options to decide whether we want to view slide show, normal slide view, or slide sorter view.
- **Drawing ToolBar :** Provides tools for drawing basic shapes, inserting pictures, changing colours, etc.
- **Status Bar :** This provides information about the current presentation, like the number of slides, the design applied, etc.

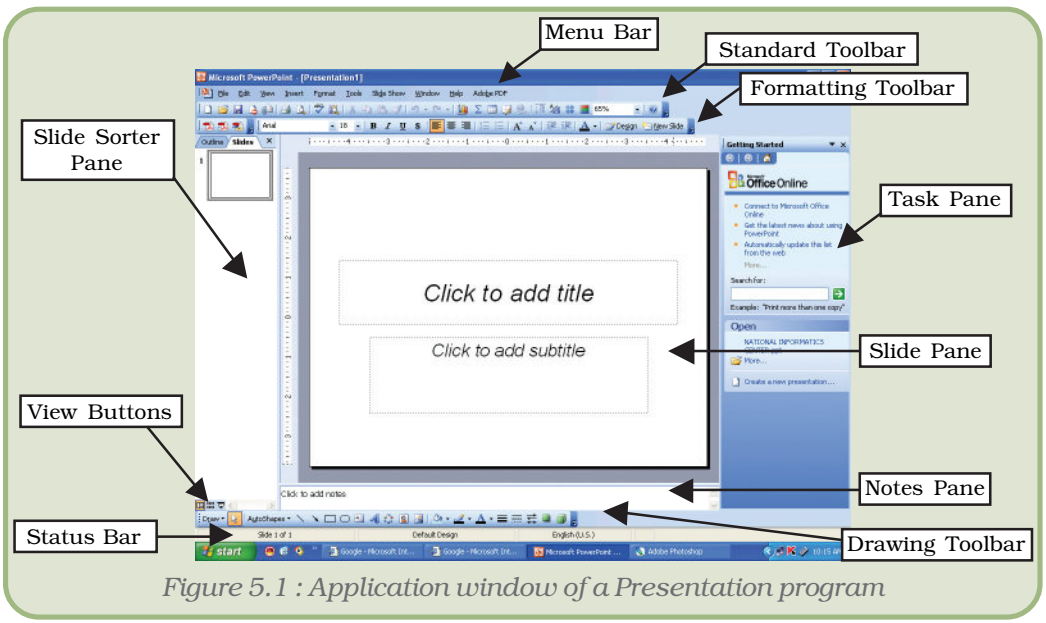


Figure 5.1 : Application window of a Presentation program

After learning documentation and spreadsheet packages, we are already quite familiar with menu bar, standard toolbar, formatting toolbar, drawing toolbar, and the status bar.

5.3 STARTING A NEW PRESENTATION

To create a new presentation, click on *Blank Presentation* on the *New Presentation* task pane. We will now see a slide on the slide pane similar to the one shown in Figure 5.1. This is called the *title slide*.

The first step to start with any presentation software is to type in some text in the slides.

It is not necessary that we have to type in something in every placeholder in the slide. For example, if we do not have any subtitle, just leave the corresponding placeholder as it is. The text '*Click to add subtitle*' will not be seen on the screen when we run the slide show.

Let us now prepare our first presentation:

- Open the Presentation Program, click on the placeholder (Figure 5.2) which says – *Click to add title*, and type text.
- *Click to add subtitle*, and type the name.

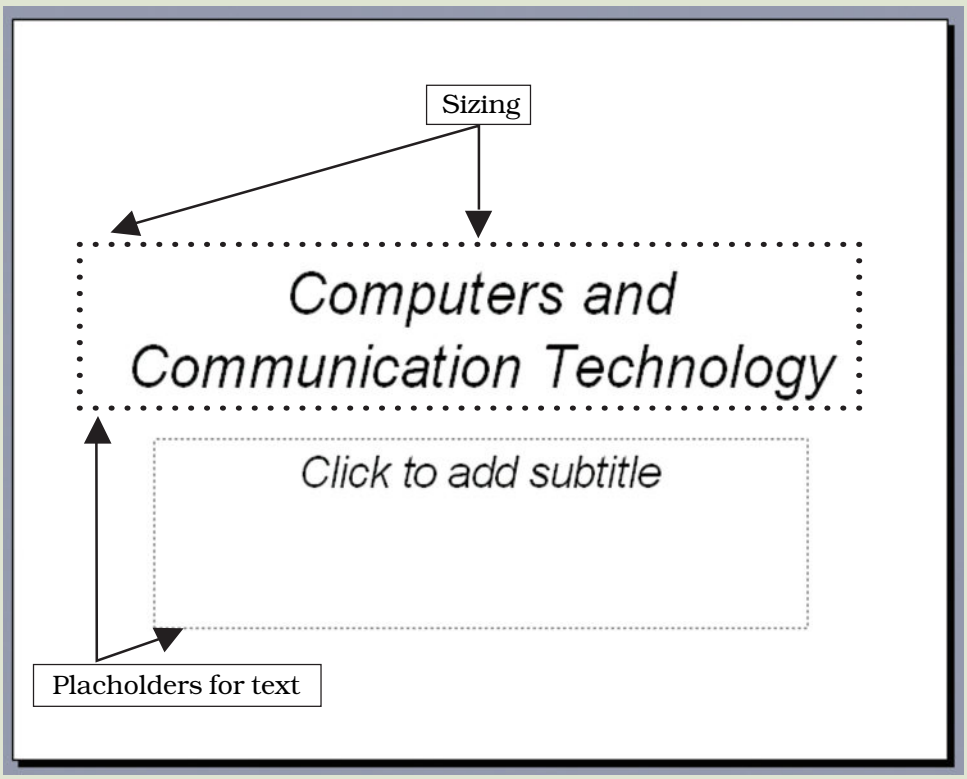


Figure 5.2 : Title slide

5.3.1 Adding a New Slide

Click on *New Slide* option on *Insert* menu or (CTRL + M) and select a desired layout from the *Slide Layout* options in the *Task Pane*. (Appendix 5.1–5.3)

5.3.2 Views in Presentation

A presentation can be viewed in several ways as per the location and demand. Some presentation options are listed below:

Normal View : This view has three panes and shows the outline, the notes area and the slide. We can type the notes in this place holder which we might require at the time of showing our presentation. Text in the notes page does not appear in the slide show.

Outline View : In this view we can see only the text of the slides in the presentation.

Slide Sorter View : In this view, slides appear of thumbnail size and they can be moved or sorted according to the requirement. Slides can be moved by first clicking them and dragging them to their desired location.

Slide Show : This view is used to show the final presentation with all the effects and colour schemes.

5.3.3 Insert Other Objects

The following is a list of various objects that can be inserted on a slide.

Table : Allows us to insert a table. We can insert the number of rows and columns required for the table, and then type in the content.

Chart : Allows us to insert a chart. We can type in the data values in order to develop the chart.

Clip Art : Allows us to insert a clip art, a variety of which normally comes along with the presentation software.

Picture : Allows us to insert picture – the ones that we might have clicked using a digital camera, or have scanned using a scanner, or have got from somewhere else. We have to provide the name of the picture file we wish to insert.

Diagram or Organisational Chart : Allows us to insert diagrams which we can select from the *diagram gallery*. One of the common options is the organisational chart (a chart showing hierarchy in an organisation, or a family tree, etc.).

Media Clip : Allows us to insert a media clip like some audio or video clips. However, to insert a media clip in this manner, Microsoft PowerPoint requires that the media clip be a part of Microsoft Clip Organiser.

Figure 5.3 shows a slide layout which can be used to insert non-text content:

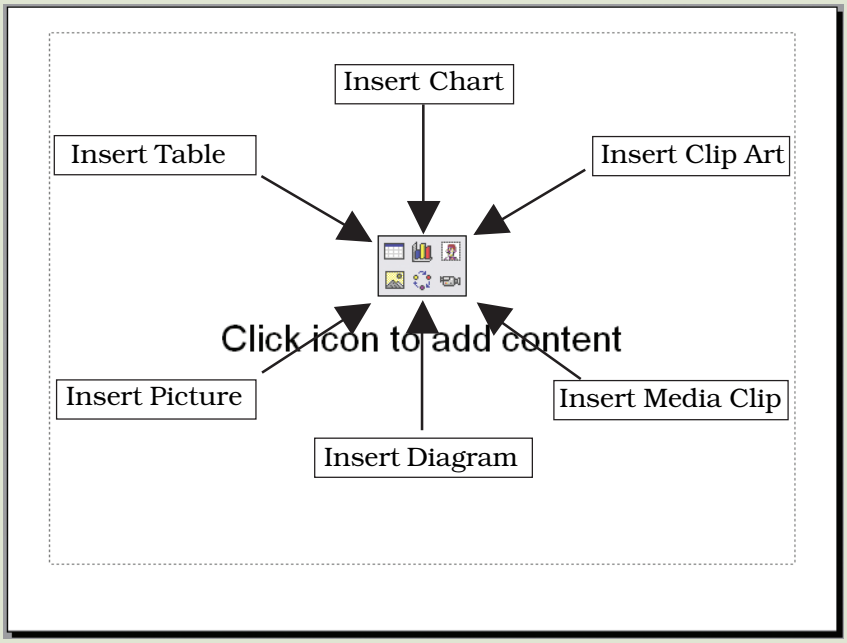


Figure 5.3 : Slide layout to insert other objects

Place the mouse over the desired non-text content and click to include the same on the slide.

We have already read about inserting Clip Art in the presentation by selecting a slide layout that allows us to insert non-text content. There is another way of inserting clip art into the slide. Let us learn this process:

- Open the presentation.
- Click on *Clip Art* under *Picture* option of *Insert* menu. We will now see the *Insert Clip Art* option in the task pane.
- We can insert some text to search clip arts belonging to a particular group. To try out, let us type in *Inspiration* and click on Search. If we are not sure, just click on Search without typing in any text.
- We will see all the available clip arts grouped under our search text in the task pane.
- Select the desired clip art by clicking on it.
- We will now get the clip art on the slide. We can change its size by dragging the sizing handles. By click and drag we can place the clip art at the desired location in the slide.

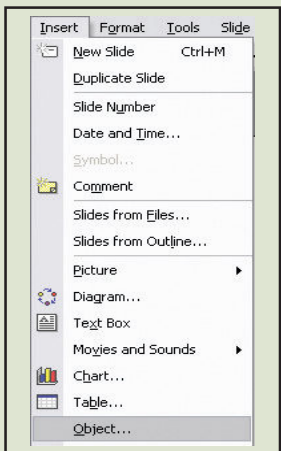
5.3.4 Create a Chart in Presentation

Sometimes it is useful to project a chart to the audience rather than listing out raw data. We have learnt how to design charts using

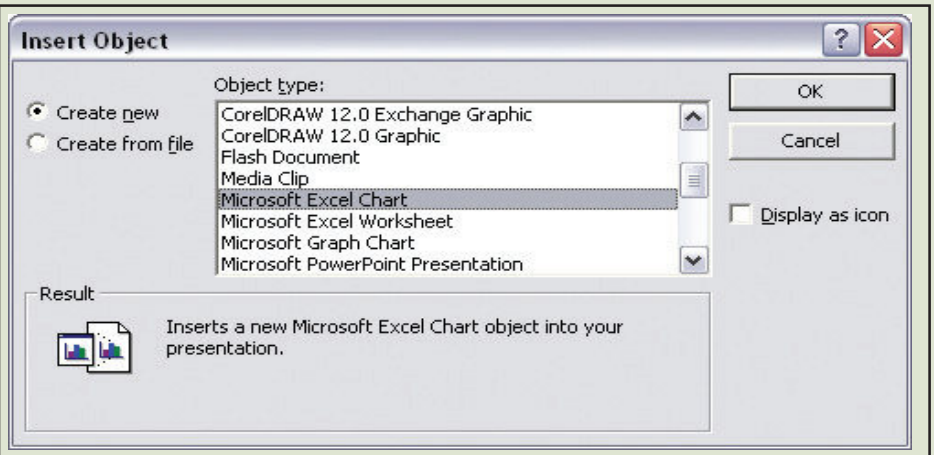
spreadsheets. Now we will learn how we can get a chart in presentation software:

- Open the slide where we want to place the chart.
- Generally a Presentation software cannot draw charts. We need to get the help of some other software. Click on *Object* under *Insert* menu (Figure 5.4 (a)).

If we plan to draw the chart in spreadsheet, select *Microsoft Excel Chart* (Figure 5.4 (b)) under Object type and click on OK.



(a) Insert with Object



(b) Insert object dialog box with spredsheet chart selected

Figure 5.4 : Insert Object dialog box

A dummy chart (Figure 5.5) appears on our slide which can be modified with our data.

- At the bottom of the chart we will notice 

. Click on *Sheet1* and feed in the data for the chart as we had done in the spreadsheet.
- We can change what the chart looks like by using the options under the *Chart menu*. (As in spreadsheet)

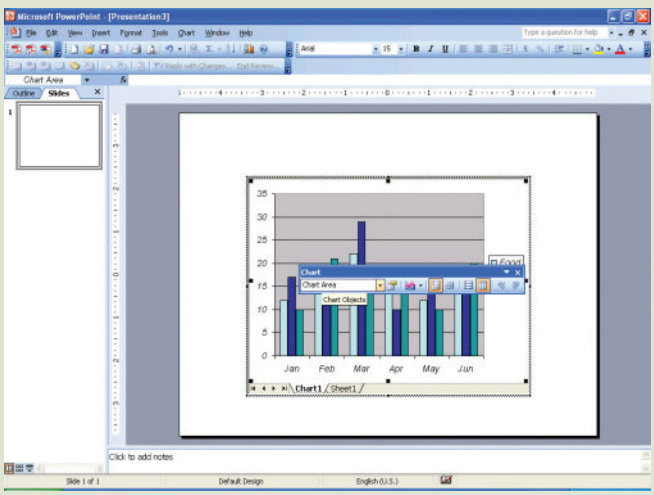


Figure 5.5 : Dummy Chart

5.3.5 Navigating Across Slides

Now that we have more than one slide in our presentation, we will need to move from one to the other while designing them. We have three different options for this:

- Press the *Page Up* (or *PgUp*) key to go to the previous slide, press *Page Down* (or *PgDn*) key to move to the next slide.

- Click on the appropriate slide on the *Slide Sorter* pane.
- Use the scroll bar that appears between the *Slide Pane* and the *Task Pane*.

5.4 SAVING AND OPENING A PRESENTATION

Once made, we would surely like to save the presentation (i.e., store it permanently) for future reference and use. The process of saving a presentation and later opening it (or to create a new presentation) is similar to what we have learnt in Chapter 3 (Word Processing Tool).

Note **:** If we add or edit anything after we have saved the presentation, we will have to save it once again. Otherwise, the changes made after the last Save operation will not be saved.

We had previously typed in some text in the a slides of the presentation. Now we save it with a filename, *My Presentation*.

5.5 FORMATTING TEXT

Now let us learn how to make the slide more presentable by formatting the text on the slides:

We can format the text either through the *Format* option under the Menu Bar, or we can use the *Formatting Toolbar* to invoke most (but not all) formatting options (as in word processing). The main formatting options are –

- Font
- Bullets and Numbering
- Alignment.

Before we format any text, we must select the part of the text we want to format. For *Font formatting*, we need to select all the characters that we want to format; while for the others, we need to select any part of the paragraph.

5.6 COPY, MOVE AND DELETE TEXT AND SLIDES

For copying, moving or deleting text from and to the same or different slide in the same or different presentation we can follow the same procedure as in the case of word processing. When we copy a slide, we actually *duplicate* the slide. When we move a slide, we end up changing the order of the slide in the presentation. These can be done as follows:

- To copy, i.e. duplicate a slide, select the slide (on the *Slide Pane* or in the *Slide Sorter Pane*) and click on *Insert* → *Duplicate Slide*.
- To move a slide or a group of slides, select the slide(s) in the *Slide Sorter Pane* and drag them to the desired location.

- To delete a slide or a group of slides, select the slide(s) in the *Slide Sorter Pane* and press the *Delete* key.

Note : To select multiple contiguous slides, press the Shift key as you click on the slides one after the other. You can also select the first one, and then click on the last one while keeping the *Shift* key pressed. To select non-contiguous slides, press the Ctrl key instead of the Shift key.

5.7 HOW TO VIEW SLIDES?

Most presentation software will provide us with three views:

- Normal view – where we design the presentation.
- Slide Sorter view – this is a view of the slides in the presentation in thumbnail form. When we have finished creating and editing the presentation, slide sorter view gives us an overall picture of it – making it easy to reorder, add, or delete slides.
- Slide Show view – this takes up the full computer screen. This is the view that we will use at the time of presentation.

We can move from one view to another by using the options under the *View* menu or by clicking on the appropriate *View Buttons*. The options under the *View* menu are given in figure 5.6.

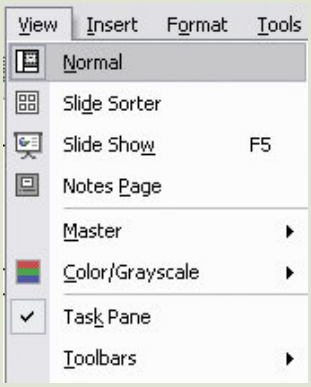


Figure 5.6 : View Options for Presentation

5.8 SLIDE SHOW : PRESENT SLIDES TO THE AUDIENCE

Now that we have somewhat prepared the presentation, its time to view the show. We are already familiar with the *Slide Show* option under *View* menu and the corresponding *View button*. We can use either of them to start the slide show. We can also start the slide show by selecting the *View Show* option under the *Slide Show* menu.

We can also save the presentation file as *PowerPoint Show*. In that case, we will not have to start the presentation program to view the presentation. Just double click on the file, and we will have the show on the screen. To save a file as *PowerPoint Show*, select this alternative under *Save as type* option in *Save As* dialog box (Figure 5.7). To open the *Save As* dialog box, click on *File* → *Save As*.

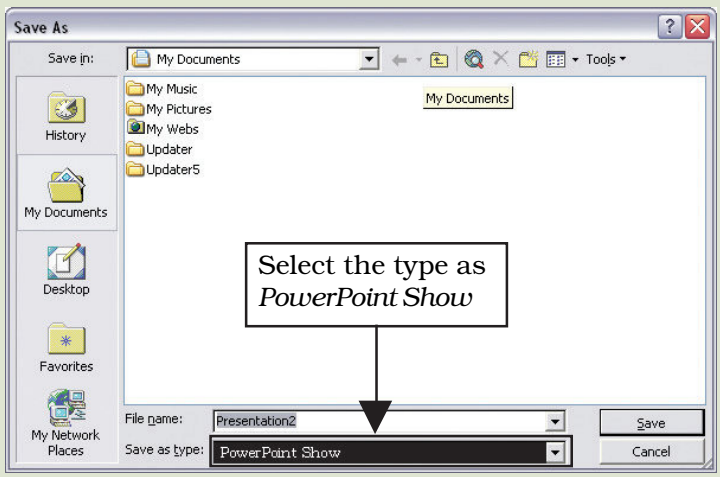


Figure 5.7 : Dialog Box to save file as PowerPoint Show

However, to run the slide show as described above, we will need to have the



Figure 5.8 : Slide Designs with the options for Templates

presentation program in the system. What happens if we take this presentation file to a machine which doesn't have a presentation program loaded? Can we run the program?

5.8.1 Slide Designs

Now let us learn how to apply Designs to the slides to make them more attractive.

A slide design determines the background colour and picture as well as the colour and type of text on it. Follow steps given below to apply slide design to the templates :

- Click on the *Slide Design* option under the *format* menu. This will show the *Slide Design* task bar as shown in figure 5.8.
- Click on any design of the choice in the task pane. This applies the selected design to all slides of the presentation.
- If we wish to apply the design to selected slide(s) of the presentation, select the slide(s) from *Slide Sorter* pane. Now, click on the arrow which appears when we move the mouse to the desired design in the *Slide.*
- *Design* task pane, and click on *Apply to Selected Slides* from the resulting menu.
- Run the slide show once more to see the effect.

5.8.2 Custom Animation/Animation Schemes

We can animate text, graphics, diagrams, charts, and other objects on the slides by following these steps:

- Select the object.
- Click on Slide show Menu and choose option Custom animation.
- Click on the effects tab to apply the appropriate effect.
- We will see numbers like 1, 2, 3 appearing against the paragraph/ objects – this is the order in which they will appear during the slide show.
- Repeat the process to apply animation for another instance, say this time for *exit* (instead of *Entrance*).
- Once again, we will need to run the slide show to see the effect. Click on Slide Show at the bottom of *Custom Animation* task pane.
- We might have to click the mouse to move from one animation to another.

5.8.3 Slide Transitions...

While animation decides how each item in the slide emerges on the screen, slide transition takes care of how the slides (and not the items on the slide) appear one after the other during the show. We can apply a particular slide transition to all the slides or to some selected slide(s).

To apply slide transitions to the presentation,

- Open the presentation.
- Click on *Slide Show* and select *Slide Transition* to see the options in the task pane (Figure 5.9).
- If we want to apply it to some selected slide(s), select the slide(s) from *Slide Sorter* pane. To try out, just select the second slide of the presentation.
- Select the desired transition effect like *Blinds Horizontal*, *Box In*, *Cover Down*, etc. from the task pane.
- If we wish, we can change the speed of transition (options are *slow*, *medium*, *fast*).

Select medium. This option is available under Modify transition in task pane.

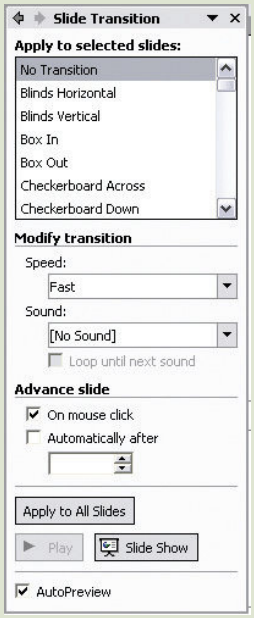


Figure 5.9 : Slide Transition Dialog Box

- In addition we can add sound that will be heard during slide transition. This option is also available under Modify transition in task pane.
- We can set the slide to advance on a mouse click, or automatically after a pre-decided delay. Select automatically and set the value to 00:11.
- Click on Slide Show at the bottom of the task pane to see the effect.
- If we wish to apply the selected transition to all slides in the presentation, click on *Apply to All Slides* button else click on *Apply*.

5.8.4 Inserting Sound/Movies...

Most presentation software allows us to enhance the presentation by inserting sound and movies. In Microsoft PowerPoint, we can add them through following steps:

- Click *Insert menu*
- Select *Movies and Sounds*. We can add them using Clip Organiser or directly from file (Figure 5.10).

If we select the Clip Organiser option, we will see a selection in task pane very similar to the one we had seen in case of inserting clip art. Choose the desired movie or sound clip, and we will have it on the slide.

The other option is to get the movie or sound from file. If we select these options, we will see *Insert Movie* or *Insert Sound* dialog box, one very similar to the *Save As* dialog box. Select the movie or sound file that we wish to insert.

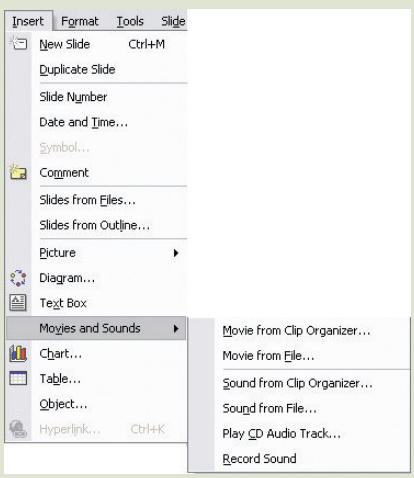


Figure 5.10 : Insert Menu with the options of Movies and Sounds

5.8.5 Navigation Between Different Slides Using Hyperlinks

A ***hyperlink*** is a connection from one slide to another or a connection to a web page, or a file.

A hyperlinked object may be a text, a graphic or an ***action button*** (a readymade button) placed on a slide, which when clicked, opens the connection (another slide, web page, file) the hyperlink was pointing to.

When we point to a hyperlink, the pointer takes the shape of a pointed finger (), indicating that it is something we can click on.

To create a hyperlink, first select the text or object that we want or represent the hyperlink with (for example, *in figure 5.11 it is the word here*). Click on *Hyperlink* from *Insert* menu. The *Insert Hyperlink* dialog box (Figure 5.12) opens up and we can browse for the file that we want to link as shown below:

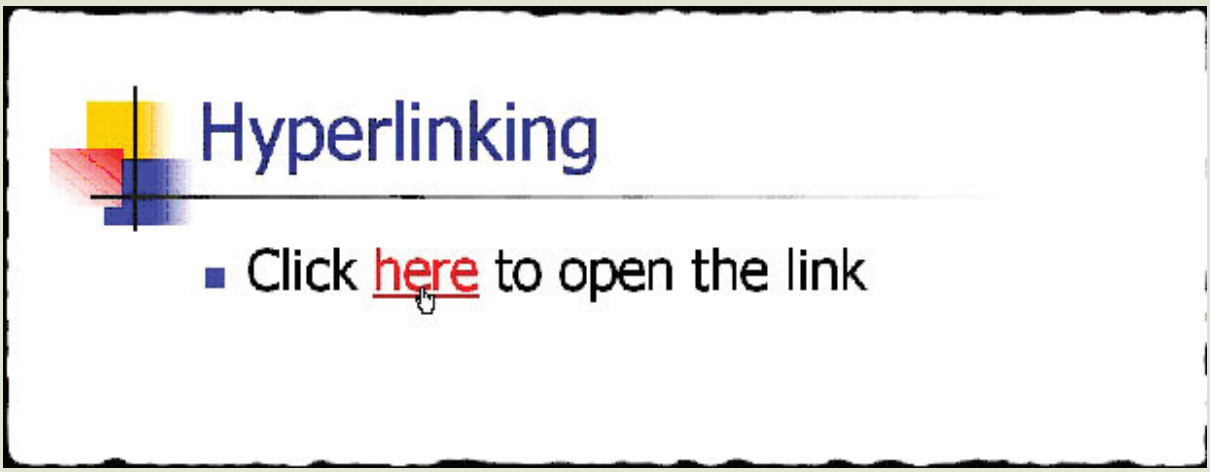


Figure 5.11 : Slide showing an object with hyperlink

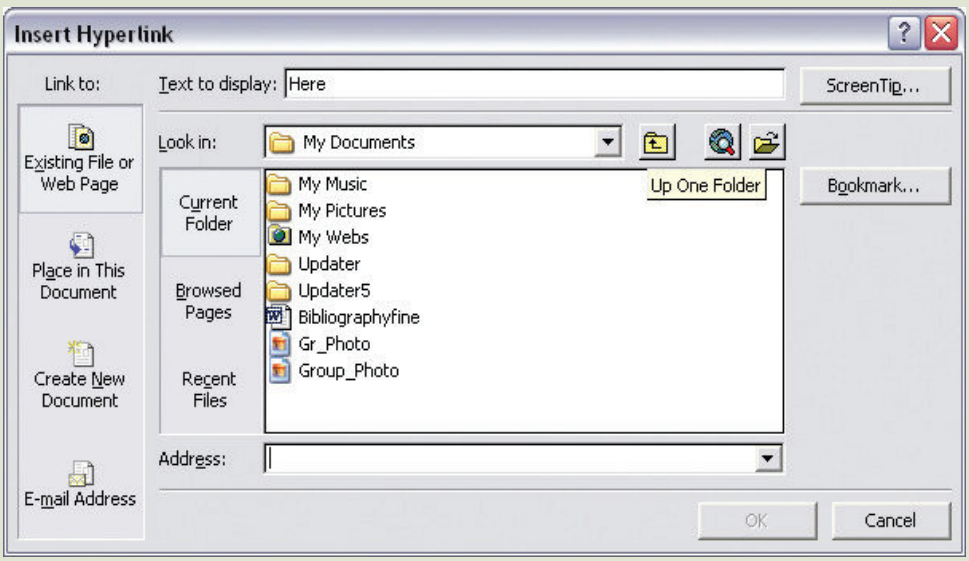


Figure 5.12 : Insert hyperlink dialog box

If we want to create a link to another slide of the same show, then

- Select '*Place in This Document*' on the left pane of Insert Hyperlink dialog box.
- We will see that all the slides of the presentation are listed in the dialog box.
- From this list, we select the slide we want to go to and click on *OK*.

If we want to create a link to another slide in a different presentation, then

- Click on Existing *File* or *Web Page*.
- Navigate to the correct folder and select the presentation to which we want to create the link.
- Click OK.

Similarly, we can make a hyperlink to a web page by giving its URL in the Address bar. For example to link to www.gmail.com, type http://www.gmail.com in *address bar* (Figure 5.13).

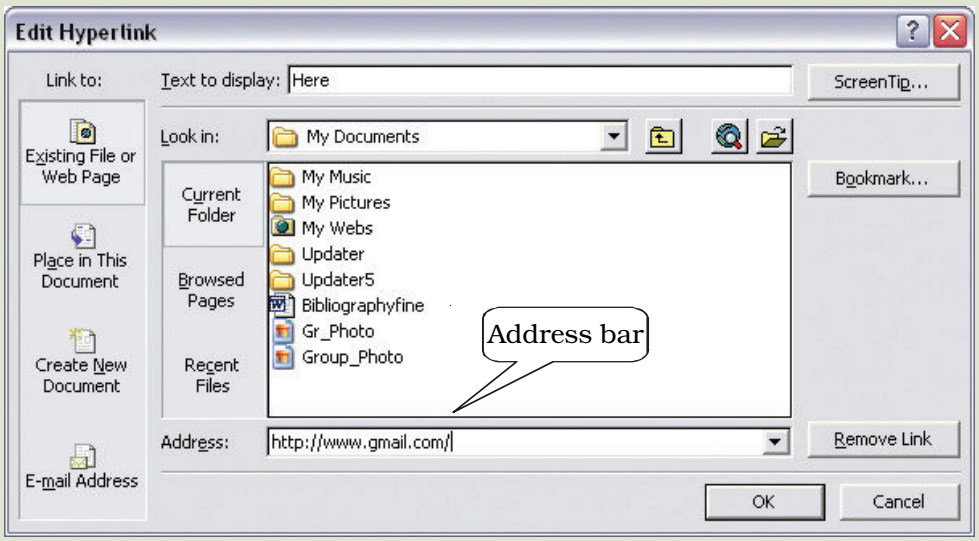


Figure 5.13 : Insert hyperlink to a web page

5.8.6 Adding Action Buttons

To insert an Action Button on the slide,

- Select the slide we want to place the button on.
- On the Slide Show menu, click on Action Buttons option and select the button we want from the resulting cascading menu (Figure 5.14).
- Click on the desired location on the slide, and we will see the selected Action Button getting placed there, which can be later resized to suit

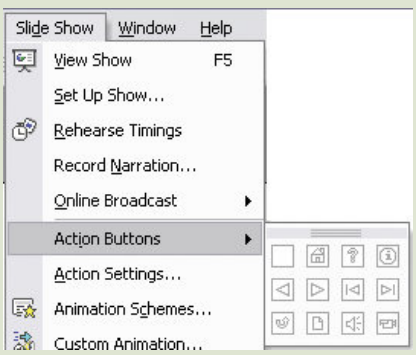


Figure 5.14 : Slide show menu with action buttons

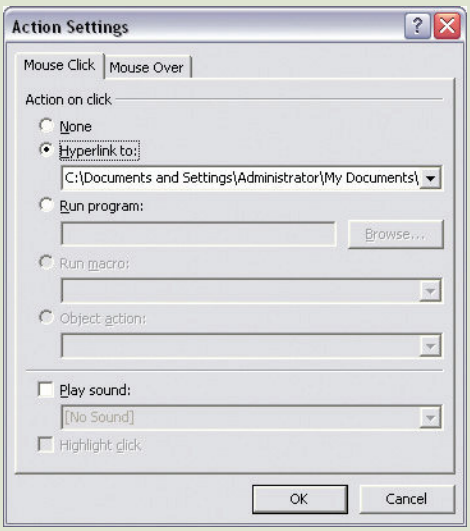


Figure 5.15 : Action settings dialog box

the requirement. Additionally, the *Action Settings* dialog box (Figure 5.15) opens up.

- Select the *Hyperlink* to option and select the desired link from the drop down list box.
- Click on *OK* to complete the process.

If we plan to insert the same Action Button on all slides of the presentation, click on *Master* on the *View* menu. Select *Slide Master*. Now place the button on this Slide Master as in the previous steps.

5.8.7 AutoShapes

AutoShapes can be used to emphasise certain points in the presentation. These are available on the *Drawing* toolbar. They include several categories of shapes: lines, connectors, basic shapes, flowchart elements, stars and banners and callouts. These can be resized, rotated, flipped, coloured and combined to make more complex shapes. We can also add text to these shapes which then becomes part of the shape. Follow the steps given below to draw an autoshape:

- Click on *AutoShapes option* on the *Drawing* toolbar
- Select the desired shape (Figure 5.16),
- Click and drag on the slide to draw the shape of desired size.

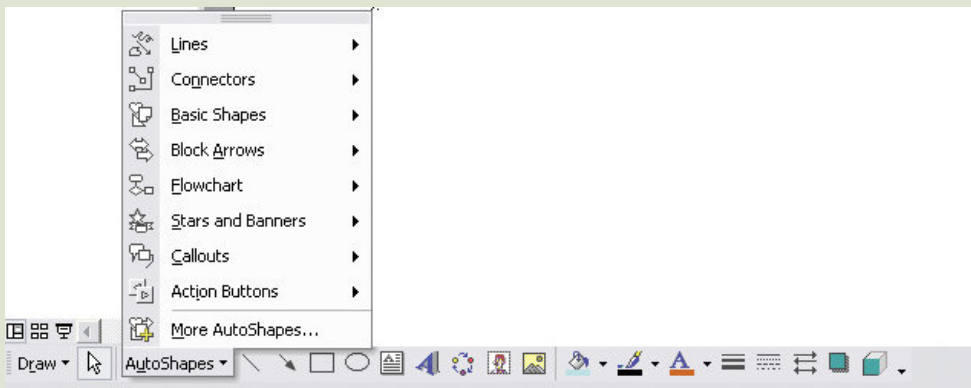


Figure 5.16 : Drawing Bar with Auto Shapes options

The handles (Figure 5.17) around a selected shape have the following purposes:

- The *Sizing handles* are the white handles around the shape which are used to change the size of the shape.
- The *Adjustment handle* is a yellow-diamond shaped handle. This handle, if present, indicates that the shape is adjustable.

- The *Rotating handle* is the green handle which can be used to adjust the angle of rotation of the shape.

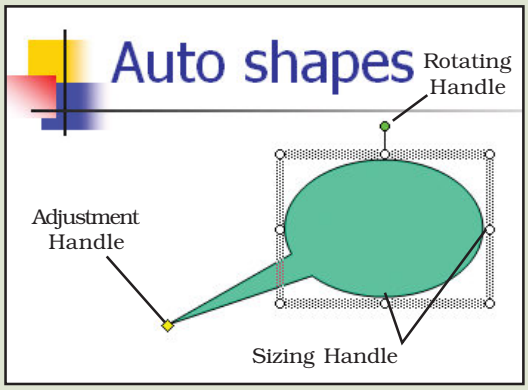


Figure 5.17 : Various handles for Auto Shapes

A shape could have graphic ***attributes*** such as fill, line, and shadow or text attributes such as style, font, colour, and shadow. To put text into the autoshape, select the autoshape and just type in the desired text; and we will see the text appearing within the autoshape. If some text is already there, the new text typed will be appended to the exisiting text.

Tools for changing the basic ***attributes*** of a shape - fill color, line color, line style (which decides on the thickness of the border), dash style (which decides whether the border line will be solid, dashed, dotted, etc.), shadow style, 3-D style and font color are located on the Drawing toolbar. For changing the attributes, we need to select the autoshape that we have placed, click on the appropriate tool on the Drawing toolbar, and select the desired option. If we want to change the text attributes other than font color, select the autoshape and click on *Font* option under the *Format* menu to set the desired text attributes.

5.9 HOW TO RUN A PRESENTATION FROM A COMPUTER NOT HAVING THE PRESENTATION SOFTWARE INSTALLED?

When we want to Run a Presentation program from a computer not having the presentation software installed then *Pack and Go* is the way to do this which is described in Appendix 5.4.

Summary

- An electronic presentation program is a computer software that is used to display information.
- A presentation can have several slides, which can be displayed one after another.
- The places on the slide where we can click and type text for the presentation are called *placeholders*.
- The font, size, alignment, etc. will be same as that of the placeholder text, unless we change them.
- We can select the layout of a slide by selecting appropriate choice from *Slide Layout* task pane.

- A slide can contain non-text content too, like – chart, clip art, media clips, etc.
- We can apply formatting to the text in the slide – we can change the fonts and their associated features; we can apply bullets or numbers; and we can decide on the paragraph alignments.
- We can copy or move the content of a slide, or even the slide itself.
- There are three views – *normal view* to design presentation, *slide sorter view* to arrange the order in which slides will appear, and finally the *Slide Show view* is used while delivering the talk.
- If we don't like the way our slides look, we can use *Slide Design* to improve them. We can apply a slide design to selected slides, or to all slides in the presentation.
- The way various items appear on the slide during a slide show is decided by the *Animation* that is applied. We can select preset animation schemes, or decide on our own using custom animation option.
- Apart from the items in the slide, we can control the way the slide itself appears during the slide show. This is done using slide transitions facility.
- Instead of listing out raw data, we can insert a chart in the presentation to make the data more meaningful to the audience.
- We can create hyperlinks on slides to connect it to other slides in the same or different presentation, or even to a file or a website.
- To facilitate navigation from one slide to another, we can include action buttons in our slides.
- AutoShapes can be used to get the audience's attention to certain points in the presentation.
- A presentation file can be made to run on a computer system not having the presentation software (Pack and Go).

EXERCISES

Short Answer Type Questions

1. What is meant by slide design?
2. What is meant by animation schemes?
3. How do you change the bullets appearing in your presentation?
4. What are the three major functions of a presentation program?
5. What are placeholders?
6. What do you mean by *Pack and Go*?
7. What do you mean by slide transition?

Long Answer Type Questions

1. How can a transition help in your presentation?
2. What are the different 'views' in the presentation package that you are familiar with?

4. Discuss the process of inserting clip art into a slide.
5. List out the process of creating a hyperlink to connect to a slide in another presentation.
6. What is an AutoShape? Discuss the formatting that can be applied to an AutoShape.
7. How is a file saved as type *Presentation* different from the one saved as type *PowerPoint Show*?
10. How can we insert clip art in a slide? Explain.
11. How can we hyperlink a slide? Explain.

Multiple Choice Questions

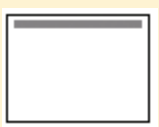
1. The presentation is seen on the computer or a projection screen in the form of
   (i) Slides
   (ii) Pages
   iii) Papers
   (iv) Handouts
2. Animation decides the way
   (i) the slides appear
   (ii) the items in the slide appear
   (iii) the text looks
   (iv) the slides look
3. The first slide of presentation
   (i) always has the layout – *Title slide*
   (ii) normally has the layout – *Title slide*, but can be changed using *Slide Layout* task pane.
   (iii) normally has the layout – *Title slide*, but can be changed using *Slide Design* task pane.
   (iv) normally has the layout – *Title slide*, but can be changed using *Slide transition* task pane.
4. While working with *AutoShapes*, you can change the style of the text using
   (i) Font Color
   (ii) Line Style
   (iii) Select *Font* from *Format* menu
   (iv) None of the above

Activities

1. Design a presentation to make your friends interested in the book that you have read recently. Ensure that you use animation and slide transitions. Use AutoShapes to design an appropriate callout in the first slide.
2. Design a presentation on your favourite singer. Ensure that you include some of his/her music in your presentation. Place a hyperlink to link to some websites mentioning his/her achievements.
3. Prepare a presentation of your hobbies like playing cricket, listening to songs, gardening, photography etc.
4. Create a family magazine containing description of your family members, their role in the family and their photographs.
5. Prepare a presentation of your school with the following contents:
   a. On the first slide, put the name and a photograph of your school.
   b. On the second page, display the features of your school.
   c. On the third page, put information about the library with a photograph.
   d. On the fourth page, Science lab
   e. And so on.
6. Suppose you are a student of class XI D and have been asked to prepare a slide show of new inventions of computer hardware. Collect latest pictures from the Internet and put them on different slides and also display their features with them.

APPENDICES

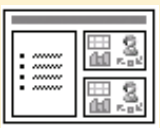
Appendix 5.1 : Text Layout Options

Text Layouts			
	*Title Slide*. Allows us to type a title and a subtitle for your presentation. Only the starting slide of your presentation will normally be of this type.		*Title Only*. Allows us to type in only a title. We can use this in place of *Title Slide*.
	*Title and Text*. Allows us to insert a title for the current slide (not the whole presentation) and the text that we want under that title. This is one of the most common types of slides.		*Title and 2-Column Text*. Similar to Title and Text, except that this allows us to enter text in two columns.

Appendix 5.2 : Content Layout Options

Content Layouts			
	*Blank.* Does not provide any placeholder. We will have to build it up from scratch if we want to use this.		*Content.* Allows us to add picture, audio, video, charts, etc. but not text.
	*Title and Content.* Very similar to *Content*, but allows us to also add a title for the slide.		*Title and 2–Contents.* Allows us to add a title and two non-text contents – like picture, chart, video, etc.
	*Title, Content and 2-Content.* Allows us to add a title and 3 non-text contents in two columns. The left column will have only one non-text content, while the right column will have two.		*Title, 2-Content and Content.* Similar to the previous one, except that the left column will have two non-text contents while the right column will have only one.
	*Title and 4-Content.* Allows us to type in a title for the slide and insert 4 non-text contents – 2 in left column and 2 in right column.		

Appendix 5.3 : Text and Content Layout Options

Text and Content Layouts			
	*Title, Text and Content.* Allows us to add a title on the top, text on the left column, 0and a non–text content on the right column.		*Title, Content and Text.* Similar to the previous one, but now the non-text content will be placed on the left column, while the text will take up the right.
	*Title, Text and 2–Content.* Allows us to add a title on the top, some text on the left column, and two non–text contents on the right column.		*Title, 2–Content and Text.* Allows us to add a title on the top, two non-text contents on the left column, and some text on the right column.
	*Title and Text over Content.* Allows us to type in a title, add some text and lastly insert some non-text content at the bottom of the slide.		*Title and Content over Text.* Allows us to type in a title, insert some non-text content and lastly add some text at the bottom of the slide.
	*Title and 2–Content over Text.* Allows us to type in a title, insert two non-text content in two separate columns, and some text in a single column below the non–text contents.		

Convergence of CCT

6

Objectives

After completing this Chapter, the student will be able to:

- *identify various terms associated with convergence of CCT,*
- *correlate communication system and its components,*
- *classify components of communication system,*
- *explain the process of data transfer,*
- *compare different data communication technologies,*
- *justify the need of convergence of technologies to meet the next generation unified applications,*
- *visualise application of unified messaging system and*
- *appreciate the importance of standardisation of various components in any system.*

"Seven hundred million people living in the rural areas need a unique rural development model called PURA (Providing Urban Amenities in Rural Areas) which envisages provision of three connectivities namely physical connectivity, electronic connectivity and knowledge connectivity leading to economic connectivity."

Dr A.P.J. Abdul Kalam

Introduction

In the earlier chapters, we saw how computer systems have become an important tool for our day–to–day functions. Online applications as ATMs, automatic complaint registration, railway reservation, etc. have improved our productivity and made our job faster and easier. In the next chapter on 'the Internet', we will see that most of the current applications are Internet based and depend heavily upon the communication systems. In this chapter we shall see that the communication systems have undergone gradual changes from the telephone system to video–conferencing. Communication systems are converging to provide next generation applications (Figure 6.1).

Even before computers were invented, there were various modes of communication like postal services, telegraphs and telephones. In the twentieth century, considerable efforts were made to develop reliable and affordable telecommunication systems.

Telecommunication systems were developed to effectively use multiple services such as television, radio news broadcasting, etc. along with the telephone. Telecommunication systems were also used for long distance communication between computers.

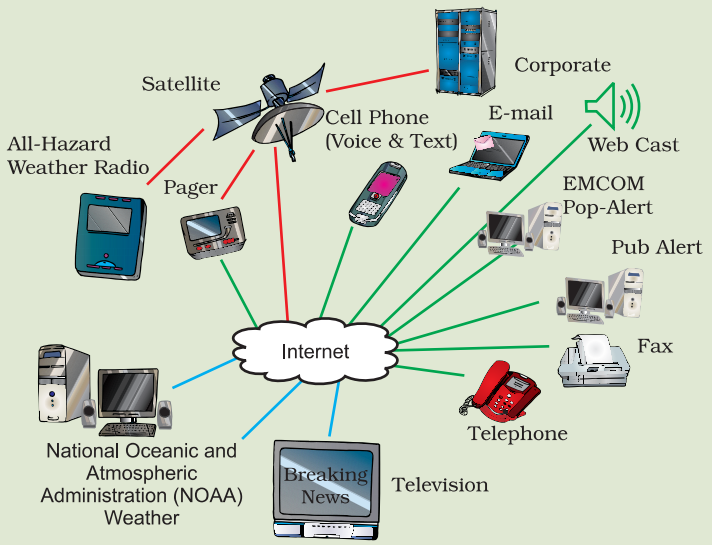


Figure 6.1 : Convergence of various communication systems

A revolution in the computer technology started in the middle of the twentieth century. Today the computer is not just a data processing device, if has become a multipurpose utility tool. The computer is being used, among many other things, for documentation, entertainment and communication.

Communication system is a very general term which means a combination of computers, communication devices, associated networks and required software.

Let's consider a simple example of sending a picture to a friend using e-mail.

Traditionally the picture could be sent through the postal service. The sender would put the picture in an envelope and post it at the nearest post office. The postal service would then deliver the envelope to the receiver. The receiver could get the picture in two days or in a month or never, and it could even get lost.

Using modern communication system the picture can be sent instantly in the following way.

To send the picture, the sender would use a scanner (Figure 6.2) to get its copy on the computer. Then the computer has to be connected to the Internet. The sender would use an Internet application such as e-mail to attach the picture and send it to the receiver's e-mail address.

The receiver could be located in any part of the world, s/he can receive the copy of the photograph within minutes. S/he would connect to the Internet and login to her/his e-mail account, download the picture into her/his computer system. If needed, a printer can be used to get a copy of the picture.

Similarly any information such as a document, an image or music can be instantly transferred to any part of the world using modern communication systems.

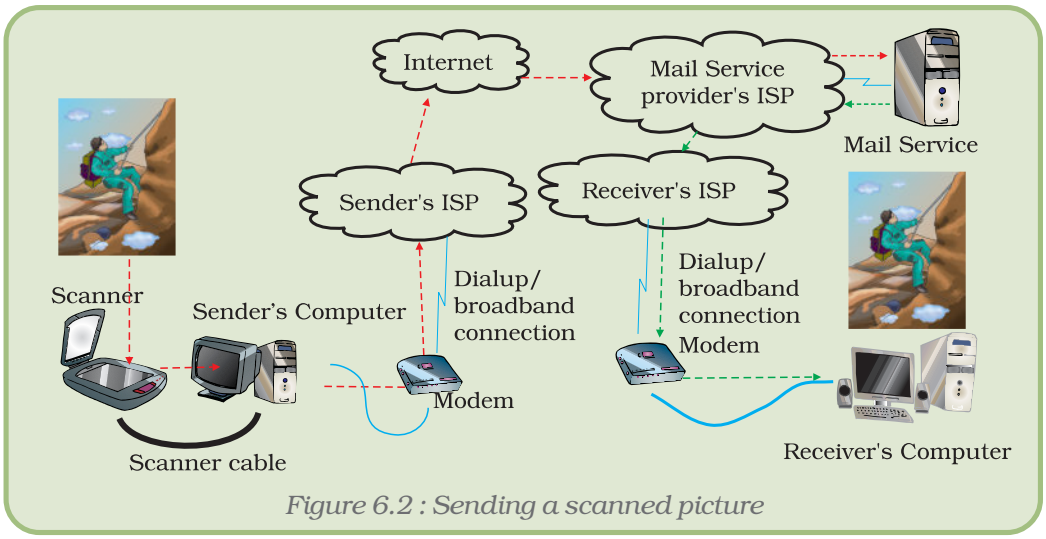


Figure 6.2 : Sending a scanned picture

Apparently this operation may look simple, but in the background there are many interconnected devices and networks that are involved. At various stages, our data (picture) is converted into various forms until it reaches the final destination.

Any information which can be digitised, whether it is voice, data or video, can be communicated through our present day electronic communication system.

6.1 COMPONENTS OF COMMUNICATION SYSTEMS

In a communication system there are various components which are interconnected through communication devices, networks and communication software. All communication systems have the following five essential components which interact with each other to provide seamless connectivity (Figure 6.3).

Information	Device	Application	Protocol	Network
Audio		File Share	X.25	LAN
		Database		Broadband
Text		Mail	Frame relay	RF
Image		Web	Ethernet	VSAT
		Conference		Dialup
Video		Chat	Internet	GSM

Figure 6.3 : Components of communication systems

6.1.1 Message

The content that has to be such communicated as document, picture, song, etc. It can be in any form such as text, number, image, audio or video.

6.1.2 Sender

The sender can be any device such as a computer, mobile, telephone, video camera, etc. which is used to send the information.

6.1.3 Receiver

The receiver can be any device such as a computer, mobile, telephone, video camera, etc. A device that receives the information.

6.1.4 Transmission medium

It is the connectivity between the sender and receiver, through any medium such as twisted pair cable, fibre optic cable, coaxial cables or radio waves.

6.1.5 Protocol

Protocols are a set of rules that control the communication between the receiver and the sender. The communication software interfaces two connecting devices and controls the flow of data. For successful communication, both the devices must follow a common communication protocol.

6.2 APPLICATIONS

These are the software or programs designed to fulfill the specific requirement of the user. Eg., Mozilla Browser, Outlook Express, etc.

Internet Service Provider (ISP) : Company that provides Internet services

6.3 EVOLUTION OF COMMUNICATION SYSTEMS

The modern communication systems started developing only after the nineteenth century with the development of the electromagnetic telegraph system.

In the telephone system (Figure 6.4), a microphone is used to convert voice signals into electrical signals and transmit the same through a pair of copper wires over a long distance. At the remote end a speaker/ earphone is used to convert electric signals back to voice. All the local exchanges are interconnected through Public Switched checked Telephone Network (PSTN) backbone. Over the years, the telecommunication system has also undergone tremendous up gradation. Today, they provide multi-functionality like FAX, SMS, television, Internet, data communication, etc.

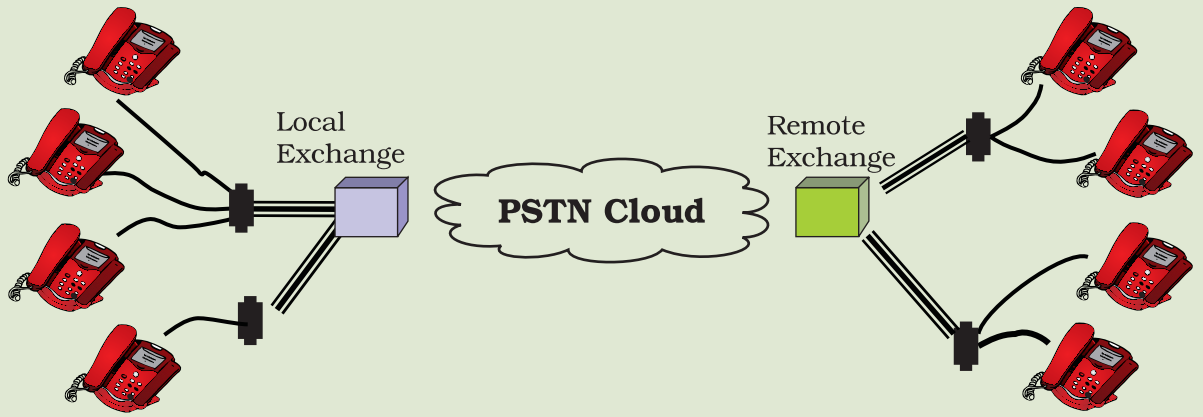


Figure 6.4 : Telephone system

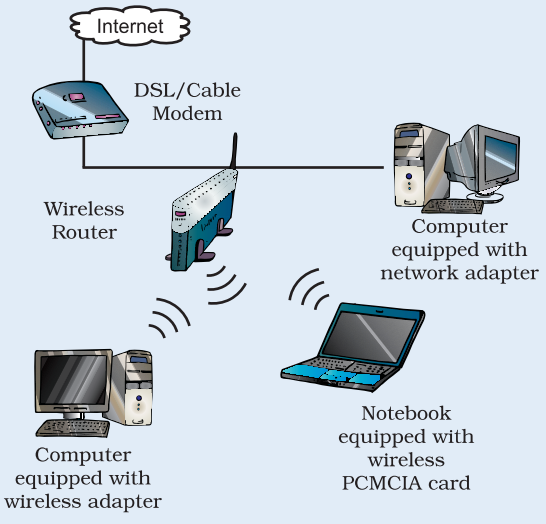
Modern PSTN uses high speed backbones with various types of transmission media such as fibre optics and wireless. The major break through in telecommunication system came after the development of following technologies.

1. Pulse Code Modulation: Technology for digitisation of voice/analogue signal into digital signals (Figure 6.5).



Figure 6.5 : Digitisation of information

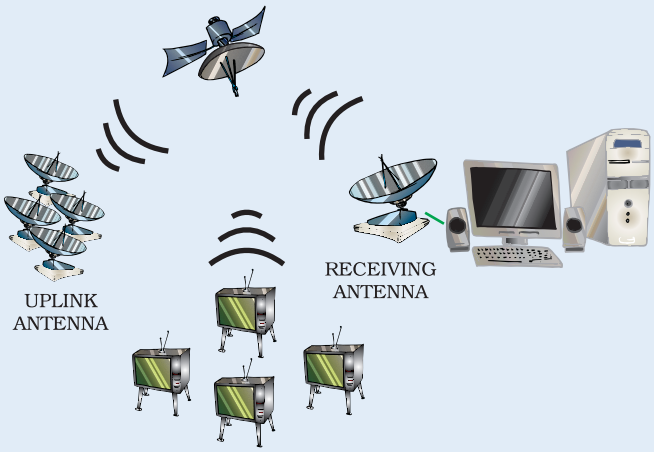
2. Multiplexing of multiple low speed signals into a high speed signal.
3. Invention of various transmission media such as wireless, fibre optic cables, etc.



Wireless Network : Communication medium where devices are not connected through any cables, but through radio waves. Mostly used for connecting areas where the users are always mobile or it is not possible to lay cables.

Wireless network

Satellite network: Communication system where signals are transmitted directly to many points spread across a large region through satellite. It is being widely used for intercontinental/long distance communication for telecommunication and television broadcasting.



Television and radio connection through satellite

Earlier computers were directly connected to devices such as terminals, printers, monitors, etc. The distance between two devices was also limited within a room or a building. The data transfer was also restricted to sending small text messages and commands.

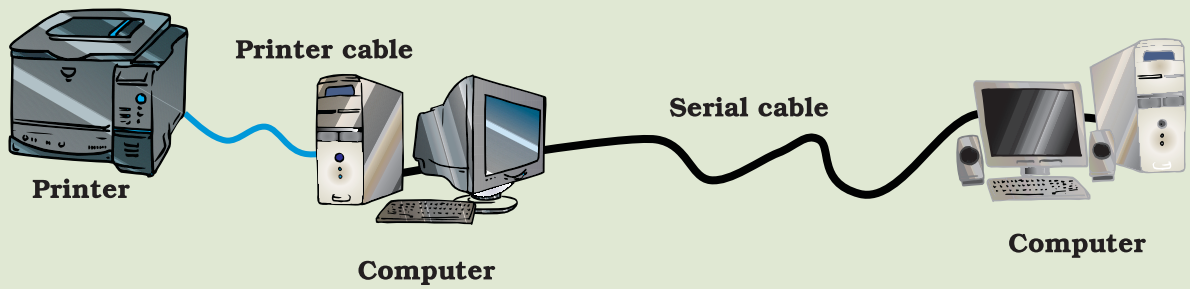


Figure 6.6 : Direct communication between two computers

Long distance data communication was done through low speed point to point connections (Figure 6.7) such as leased lines and dial-up.

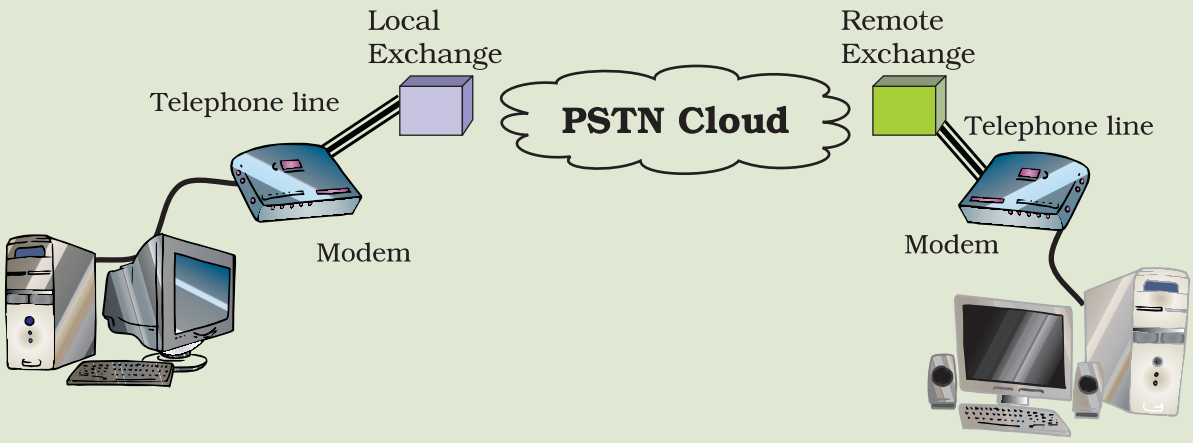


Figure 6. 7 : Long distance point to point connection through Modem

Leased lines and dialup connections use telecommunication infrastructure as their backbone. At both ends, an electronic device called a modem is used to terminate the connection. Modems modulate digital signals from computers into voice graded analogue signals, and then transmit these analogue signals through telephone lines. At the remote end, the analogue signals are demodulated into digital signals. In ***dialup*** and leased line connections, the telephone lines could either be used for data communication or for voice communication, but not simultaneously.

With telecom technologies such as ISDN and Broadband, the telephone connection can now be used simultaneously for voice communication as well as data connection (Figure 6.8).

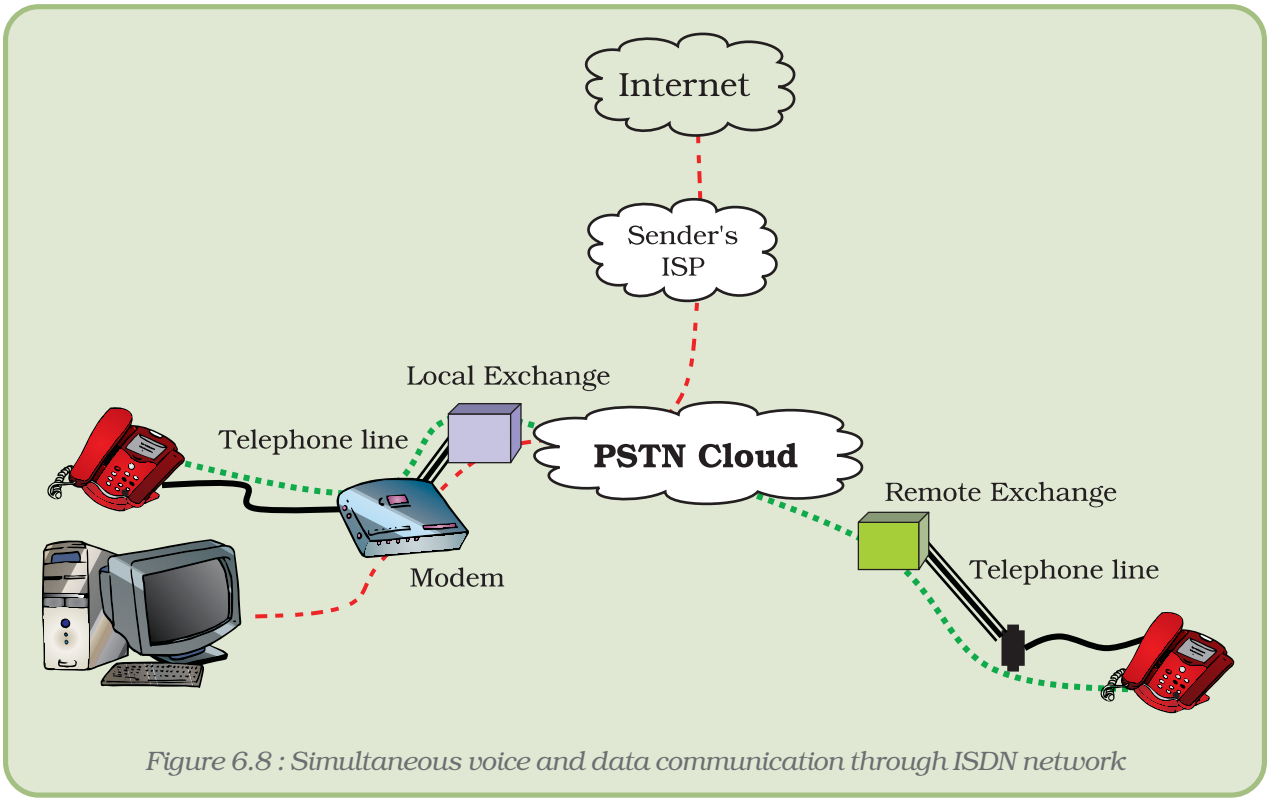


Figure 6.8 : Simultaneous voice and data communication through ISDN network

6.4 CONVERGENCE OF COMMUNICATION TECHNOLOGIES

Earlier, there were separate networks for voice, video and data communication. These networks did not meet the requirement of next generation integrated multimedia applications such as video conferencing, Net-meeting, etc. which require simultaneous transmission of voice, data and video. Efforts are made to develop integrated solution to support multimedia applications through a single communication system. As more and more tasks are becoming computer dependent, convergence of the technologies has become a necessity.

Objectives of convergence of communication technologies are –

(i) to provide cost effective communication system.
(ii) to make deployment easier and convenient.
(iii) to make optimum use of existing infrastructure to support multimedia applications.
(iv) to develop high availability and high speed network to support online interactive application such as telemedicine, video-conferencing.
(v) to provide inexpensive unified services.

The emergence of global competition is also driving the ISPs to provide unified services like email, talk, chat, web search, etc. from a single platform, using the existing infrastructure.The tele-communication service providers started giving additional services like Internet access, broadcast services like video-on-demand, IPTV, etc. Customers are also opting for such ISPs who can provide single point solution for all required services.

Data networks are now extensively used for telecommunication services such as Voice over Internet Protocol (VoIP) and broadcasting services like IPTV. Even the cable TV operators are providing Internet connection along with cable connection. Today mobile phones are equipped with Internet and FM radio services.

The equipment manufacturers are developing plug and play devices that can be connected with multiple networks and can be controlled from remote locations.

6.4.1 Developing Uniform Data Representation and Digitisation Technologies

Digitisation of data is the first step in the process of convergence. All types of data whether text, number, image, voice or video, can be represented in the binary form. Digitisation is the process to convert any type of data into binary digits that can be processed by any computing device.

The motivation behind this digitisation is the fact that the computer works on the principle of manipulation of numbers. If any data is in binary form, it can easily be manipulated by the computer. Therefore, efforts are on to develop technologies to digitise various types of data for better storage and transmission. Once digitised, irrespective of the type of data, the same communication system can be used for transmitting.

6.4.2 Convergence of Standards and Protocols

During communication, the message is processed at various stages by several intermediate hardware and software components. It is cost effective and easy to integrate if all the components follow uniform protocols and standards. There are some standards and protocols which have become very popular and have emerged as standards.

These standards are followed by industries and manufacturers. Some such protocols are –

1. Internet Protocol (IP) is the most popular protocol to interconnect different networks.
2. Ethernet is most popular standard for Local Area Network.
3. ***HTTP*** is most popular protocol to connect web applications.
4. MPEG is compression technology for transmission of video.

The function of Internet Protocol is similar to our postal delivery system but is electronically processed and is very fast.

In the traditional postal system, the message, written in the form of a letter containing receiver's and sender's addresses, is dropped in the nearest letter box. Letters collected from all the letter boxes are segregated as per the state/city in the post office. All letters to the same city are bundled and sent through air/train depending upon the distance and availability. At the remote city, the letters are unbundled and sent to the respective local post offices. Finally the letter is delivered to its destination through the local postman.

Similarly in the Internet (Figure 6.9), all messages are sent in the form of packets called IP packets. Each packet is marked with source address and destination address. Like every person is identified with a name and address, each computer connected to the Internet is also identified with a unique address/name termed

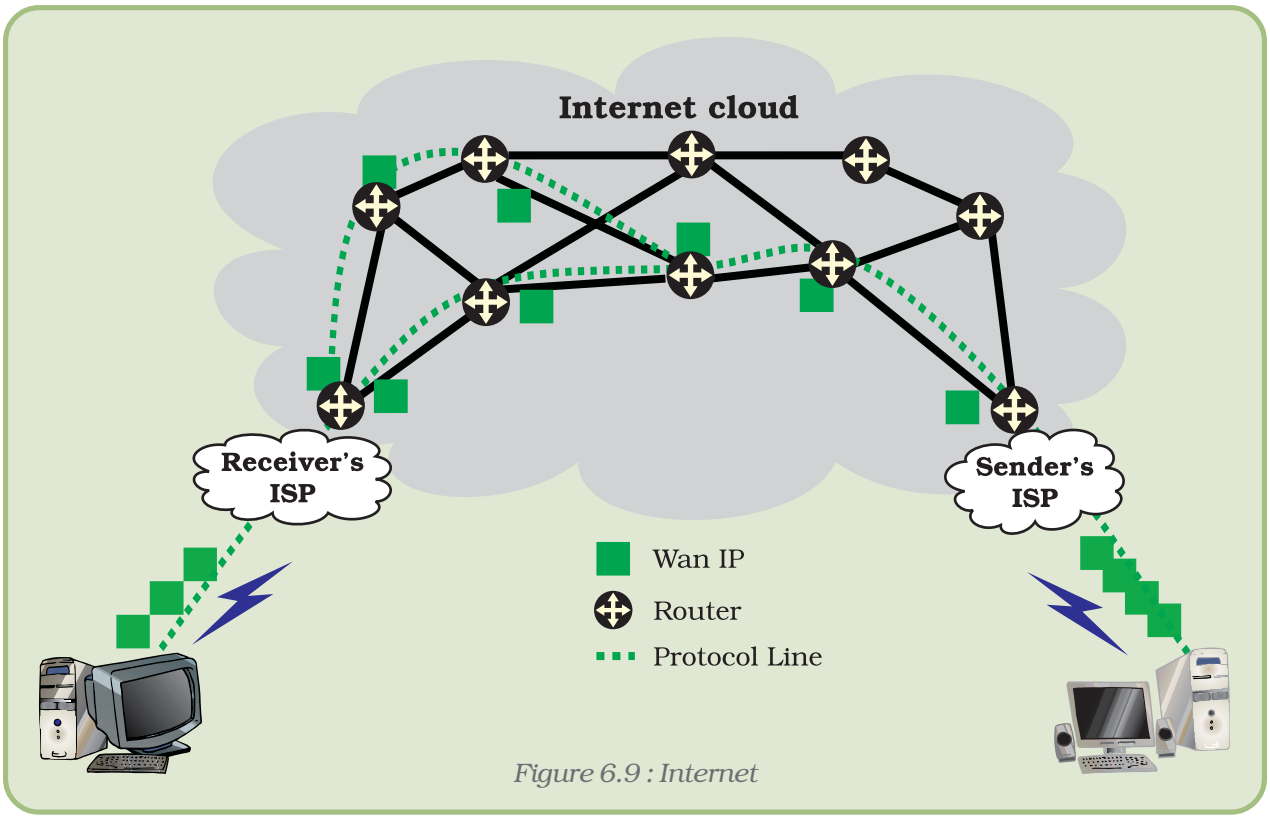


Figure 6.9 : Internet

as IP address/***domain name*** respectively. The computer sends the IP packet directly to the connected IP network. In the Internet the packets are forwarded from one network to other as per the destination address till it reaches the receiver.

Internet Protocol has become very popular as it can withstand and overcome the frequent breakdown of communication links. It was designed to automatically find an alternative path and continue the communication without any break.

Ethernet (Figure 6.10) is another communication protocol which has become very popular for connecting communication devices through various types of transmission media such as copper, wireless and optical fibre. It can support various data transfer rate as 10 Mbps/100 Mbps/ 1 Gbps/10 Gbps and is very simple to implement. Today all computer peripherals such as printer, scanner, etc. are equipped with Ethernet interface instead of serial/parallel interfaces.

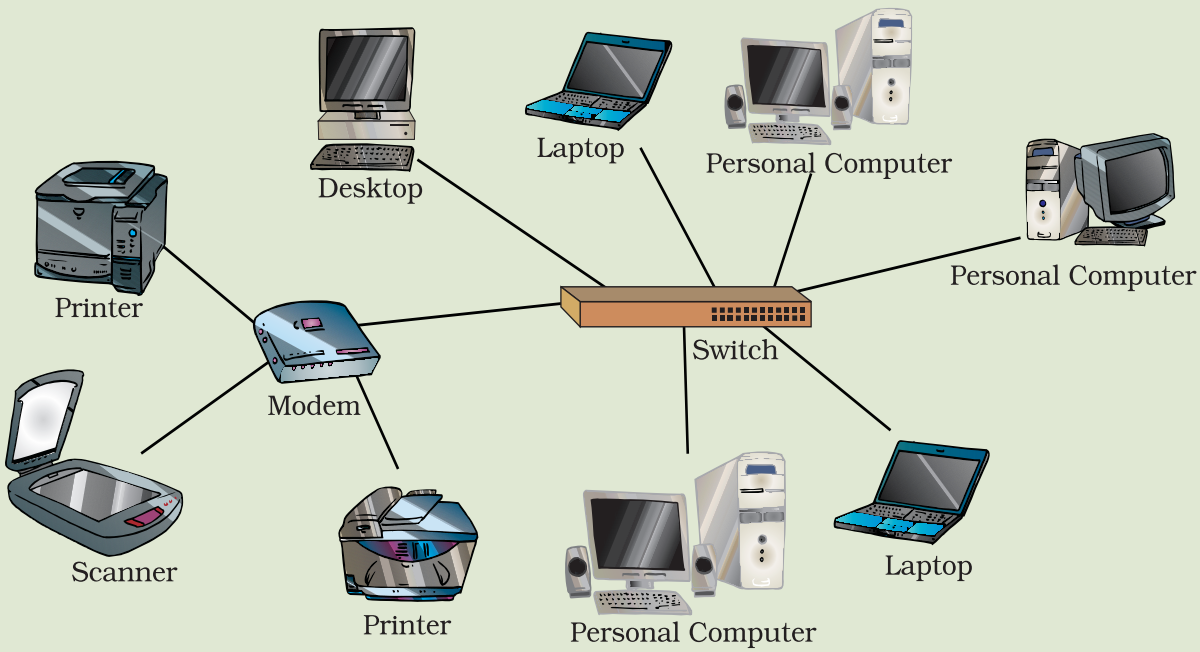


Figure 6.10 : Convergence of computer and other devices with Ethernet and IP

6.4.3 Convergence of Network

Broadband is one simple example of convergence of voice, video and data. Broadband is the latest communication technology using which a user can have simultaneous voice calls, Internet access and cable television over the same telephone line (Figure 6.11). Effort is being made to provide more high bandwidth services through various types of transmission media.

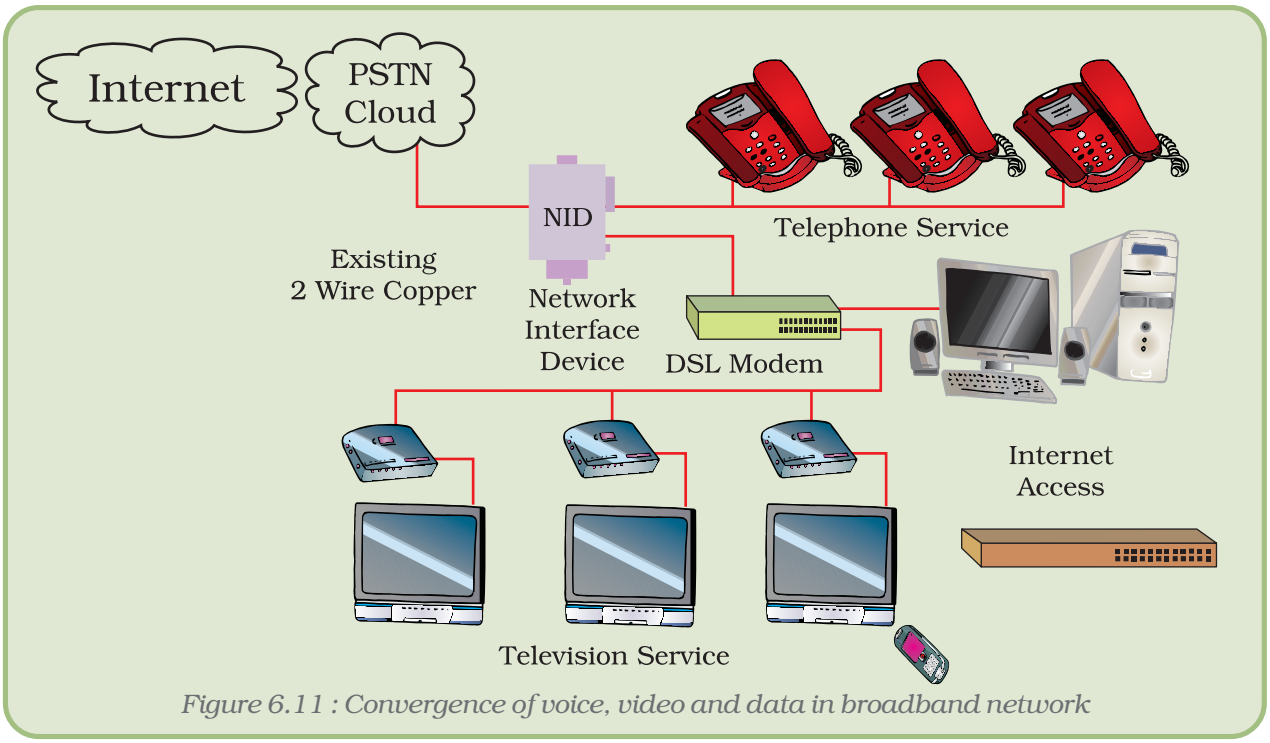


Figure 6.11 : Convergence of voice, video and data in broadband network

6.4.4 Convergence In Voice Communication

In this age of convergence, voice communication can be done from multiple networks with multiple connecting devices and from multiple locations (Figure 6.12). The mobile phone connected to wireless network can communicate with landline telephone connected to PSTN network as

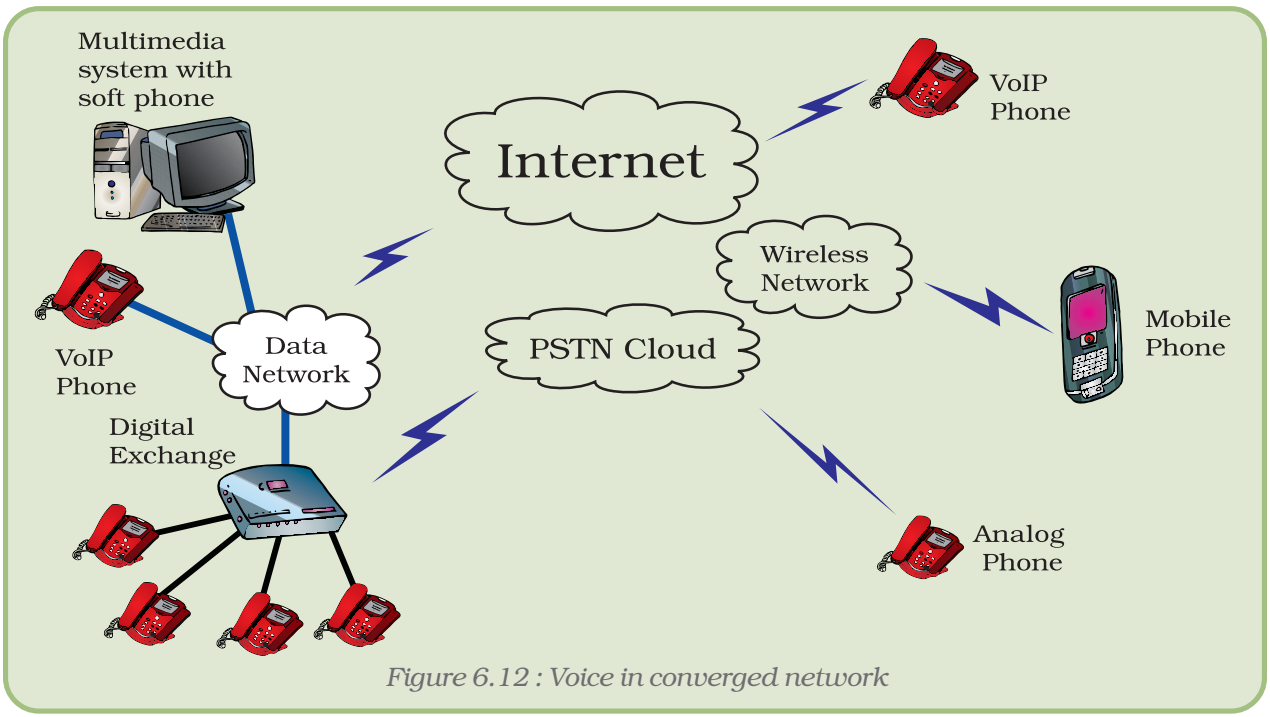


Figure 6.12 : Voice in converged network

well as with multimedia computer connected with the Internet. Instant messages can be sent from a computer to a mobile phone. Devices from one network can communicate with devices from other network through gateways. Gateways are communication devices used to interface different networks. Manufacturers are developing multipurpose plug and play devices which can be connected anywhere at any time.

6.4.5 Convergence of Video Communication

Video–conferencing and video–streaming (Figure 6.13) are some of the multimedia applications gaining popularity. Video-conferencing was primarily done through point-to-point connection like ISDN, leased line, etc. and required specialised equipment.

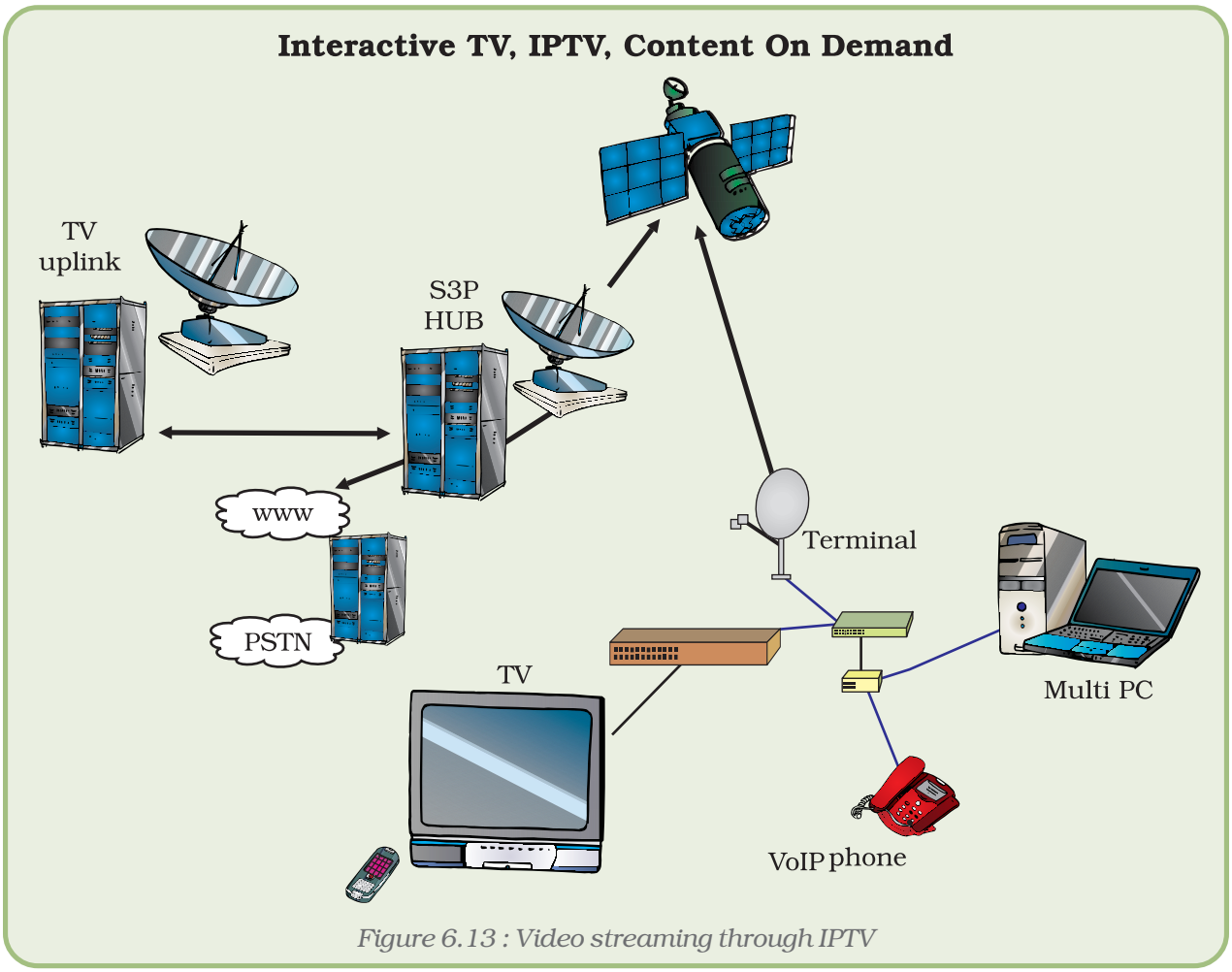


Figure 6.13 : Video streaming through IPTV

Today, thanks to convergence, video-conferencing is done through IP networks and does not require costly video conferencing systems; all that is required is a multimedia system with a camera and associated software.

High quality and reliable video-communication is possible with the development of features like Quality of Service (QoS) and video compression techniques such as MPEG.

The technology to prioritise IP packet containing voice and video traffic over other data packets is called Quality of Service.

Moving Pictures Expert Group (MPEG) algorithms compresses video data to reduce number of bytes that can be easily transmitted and then decompressed.

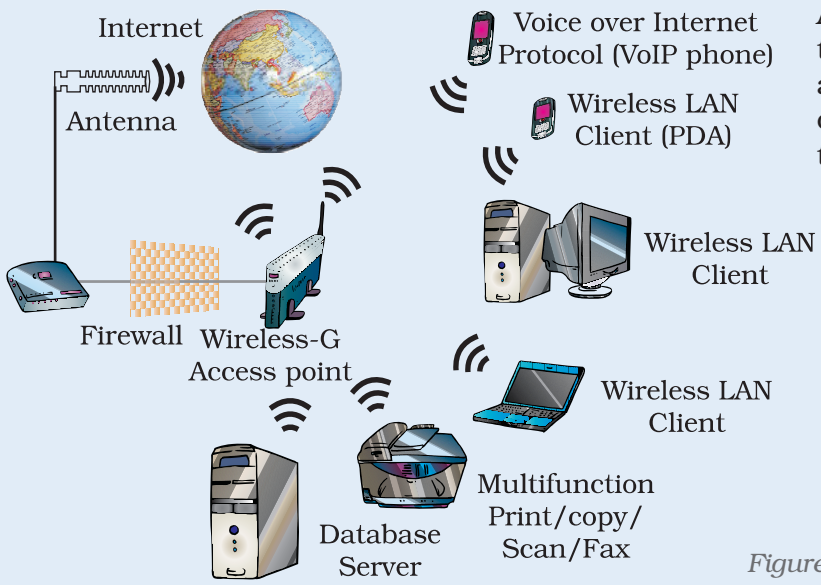
Since video traffic requires high bandwidth, it becomes difficult to get acceptable quality when transmitted through low speed PSTN or satellite links. These video signals are therefore compressed and formatted before transmission. Video compression techniques such as MPEG4 can compress video data upto 100 times which can then be transmitted through low speed networks.

Earlier news and movies were telecast through broadcast media using satellite, wireless and cable. The signal quality was noisy and non interactive. Now with technologies like IPTV and video-on-demand, high quality video can be received. IPTV is a broadcast service provided by telecom operators through their PSTN networks. The user can view the video telecast through their traditional TV sets as well as computer systems.

Video-on-demand is another video streaming service where the user has the option to select what s/he wants to watch from among those stored in the media server.

6.4.6 Convergence of Wireless Network

Wireless is one of the fastest growing networks. The demand is growing as more and more users require access to Internet from multiple locations. It is becoming as essential as mobile phones.



Access points are similar to the Ethernet device where all computers with wireless card can connect for data transmission.

Figure 6.14 : Convergence of wireless

Wireless LAN, WiFi and WiMax are few such technologies which provide high speed data communication over wireless networks. Computer systems are designed with built-in wireless interface cards which can connect to any type of wireless networks. In wireless network, computers are connected to the nearest available access point.

The access points are connected to other networks through wired Ethernet connection or broadband connection.

With third generation mobile technology such as GPRS, one can use mobile devices to access multi-service applications like voice communication, Internet and video conferencing.

6.4.7 Convergence of Applications

Web browsers like Internet Explorer, Firefox, etc. are the accepted client applications for Internet access. Most equipment manufacturers are providing web interfaces for management and control of their systems instead of product specific client application.

Most of the applications are developed with web interface so that the application can be accessed from a standard client application supplied as part of the operating system.

Another example of convergence of application is unified messaging system. There are many popular web service providers, for instance Yahoo, MSN and Google, who started with either e-mail or search engines, but are now providing a banquet of messaging services like email, chat, instant messenger, conferencing, file sharing and VoIP.

There are several applications that can replace multiple communication devices such as telephone, fax, answering machine, books, etc, with one multimedia computer. The number of such services and applications are increasing day-by-day. Broadband and Direct-to-Home (DTH) are some communication technologies which allow interactive TV services such as movie-on-demand, Internet access, video conferencing and e-mail, all through a single connection.

In a nutshell, any data that can be digitised can also be communicated through a converged communication system. The distinct division between telecommunication and data communication has faded into one converged communication system. Efforts are on to make more and more services IP enabled and networked.

In the next chapter, we shall discuss various Internet applications used for communication.

6.5 IMPORTANCE OF STANDARDISATION

Standardisation plays an important role in every sphere of our day-to-day life. Standardisation is the process of agreeing on technical specifics of any process or product.

The goals of standardisation are to have compatibility, interoperability, safety, repeatability and quality. In a competitive market, it is very important for industries to maintain the standards to flourish in their trade. There are predefined standards set for the IT industry too. This is to guarantee the interoperability and compatibility between products from different vendors. There are various standardisation organisations worldwide which are primarily engaged in the documentation, research, development, and testing in the field of computer hardware, software and communications to formulate standards. Once a standard is accepted, the vendors can design and develop the product as per the standards.

Some important standardisation organisations in the field of Information Technology are as follows –

- ANSI (American National Standards Institute)
- ITU (International Telecommunication Union)
- IETF (The Internet Engineering Task Force)
- IEEE (Institute of Electrical and Electronic Engineers)
- EIA/TIA (Electronic Industry Association/Telecommunication Association)
- ISO (International Standards Organisation)
- VESA (Video Electronics Standards Association).

The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. While IEEE is generally concerned with hardware, ANSI has been primarily concerned with software. ANSI has defined standards for a number of programming languages including C, C++, COBOL and FORTRAN. All these organisations collectively provide the framework of the standards which bind IT across the world. They let us work easily across regions, without being bogged down with compatibility issues. For example, IEEE developed a set of network standards to facilitate interoperability among various make and models of network devices.

ITU defines international standards, particularly for communication protocols. It has defined a number of standards, including V.22, V.32, V.34 and V.42 that specify protocols for transmitting data over telephone lines.

EIA/TIA specifies generic telecommunication cabling system which supports multiproduct, multivendor environment. For example, EIA/TIA 568A and 568B standard is for the pin configuration of LAN cable.

Apart from these standardisation organisations, there are region specific associations of manufacturers who also contribute to the development of standards to meet the needs of that particular region.

In India there are few standardisation organisations like BIS (Bureau of Indian Standards), which actively participate in the development of standards in various fields.

Summary

- Telecommunication is the use of electronic system to send and receive voice, data and video messages.
- Broadly there are five components of communication system, namely information/ message, device, application, protocol and network.
- Voice communication requires telephone instruments like telephone, mobile or VoIP phones for PSTN, wireless or data network.
- Data communication allows transfer of information and remote management of devices.
- Data communication is undertaken by directly connected computers, printers, etc. in a Local Area Network.
- Long distance data communication is done through point to point connections using PSTN or wireless networks.
- Broadcasting of audio and telecasting of video service such as radio and television is done through wireless links.
- Ethernet is the most popular LAN technology for data communication which provides communication speed up to 10Gbps.
- Internet Protocol (IP) connects the computer across similar or diverse networks.
- In IP, data packets are transmitted in packets containing unique IP addresses for the source and the destination.
- IP automatically routes the packet to its destination through any available path.
- Convergence of technologies is required to meet the next generation unified applications where all the three forms of data are required to be transmitted simultaneously.
- IP is internationally accepted protocol through which all different forms of data can be communicated.
- The approach to convergence is to make all components of communication systems IP enabled.
- While trying to achieve convergence, effort is on to use existing infrastructure with partial upgradation.
- Broadband and IPTV are two next generation technologies which use PSTN to provide unified services for voice, data and video.
- VoIP is a data communication technology which allows IP phones and computers to connect to telephones through PSTN and mobile networks.
- Unified messaging system is provided by web service providers which can be used to access multiple services like e-mail, chat, call and entertainment from a single computer system with Internet connection.
- Standardisation is very important for interoperability of various components in any system,
- There are organisations which develop standards, rules and specification for a product that the manufacturers have to meet.

EXERCISE

Short Answer Type Questions

1. What is coding?
2. Why is digitisation required?
3. What are the emerging technologies that support voice, data and video?
4. What are the services provided by a broadband connection?
5. Why are unified messaging services becoming popular?
6. Explain features of circuit switching technology.
7. What are the features of packet switch technology?
8. Explore the sites which provide unified messaging services.
9. Explore the easiest way of connecting computers in a LAB.
10. Explore the easiest and fastest way of connecting computers on a campus.

Long Answer Type Questions

1. Identify the five components of data communication when a file is printed.
2. Identify the type of interfaces that are available in the computer and printers in your school lab.
3. Find out the various services provided by your local service provider. And compare the charges against each service among the local ISPs.
4. Find out the various ways a home computer can be connected to the Internet.
5. Configure a broadband connection for data and voice communication.
6. Explore some traditional means of communication.
7. What are the benefits of standardisation?
8. Find the specification of your computer system.
9. Identify the components of data communication.
10. Identify the components of mass communication.
11. How is voice communication different from data communication?
12. Explain the benefits of digitisation of Audio and Video Signals.
13. How does long distance data communication work?
14. Why is it easies to setup Ethernet network than X.25?
15. What are the advantages of Internet Protocol?
16. What is convergence of communication technology?
17. What are the benefits of convergence of communication?
18. Explain the constraints in the convergence of communication.
19. What are the various approaches to meet the requirements of next generation application?

Multiple Choice Questions

1. The 1st modern telecommunication device was
   (i) Telephone
   (ii) Telegraph
   (iii) Computer
   (iv) Television

2. Set of rules that controls communication between two devices is called
   (i) Network
   (ii) Application
   (iii) Protocol
   (iv) Media

3. Example of packet switching technology
   (i) Ethernet
   (ii) X.25
   (iii) Broadband
   (iv) RS 232

4. Example of Frame switching technology
   (i) Ethernet
   (ii) X.25
   (iii) Broadband
   (iv) RS 232

5. Circuit switching network is
   (i) Point to point
   (ii) Multipoint
   (iii) Connectionless
   (iv) Virtual connection

6. ISDN is telecommunication technology where
   (i) Simultaneous voice and Data
   (ii) Only Voice
   (iii) Only data
   (iv) Only Video

7. Internet Protocol (IP) is
   (i) circuit switching
   (ii) packet switching
   (iii) frame switching
   (iv) point to point

8. Broadband is a convergence technology for
   (i) Voice, data and video
   (ii) Only data
   (iii) Only voice
   (iv) Only video

9. VoIP technology enables to connect
   (i) Only PSTN telephones
   (ii) Only Mobile telephones
   (iii) Only VoIP telephone
   (iv) All IP enabled telephone systems connected to the Internet.

10. GPRS is used in mobile phones for
    (i) Data communication
    (ii) Voice communication
    (iii) Send SMS
    (iv) None of the above

Activities

1. Identify the five components of data communication when a file is printed.
2. Identify the type of interfaces that are available in the computer and printers in your school lab.
3. Find out the various services provided by your local service provider. And compare the charges against each service among the local ISPs.
4. Find out the various ways in which a home computer can be connected to the Internet.
5. Configure a broadband connection for data and voice communication.
6. Find the model of the mobile phone available in your locality which supports voice as well as Internet.
7. Explore the sites which provide unified messaging services.
8. Explore the most easiest way of connecting computer in a LAB.
9. Explore the easiest and fastest way of connecting computers on a campus.

THE INTERNET 7

Objectives

After completing this Chapter, the student will be able to:

- *explain the basics of the Internet and its origin,*
- *describe functioning of the Internet,*
- *give examples of Internet services,*
- *write terminologies of the Internet,*
- *list various usage of the Internet,*
- *illustrate how to surf different websites,*
- *demonstrate how to download files,*
- *open an e-mail account,*
- *send and receive emails through an email account and*
- *store and retrieve addresses from the address book.*

The Internet is based on a layered, end-to-end model that allows people at each level of the network to innovate free of any central control. By placing intelligence at the edges rather than control in the middle of the network, the Internet has created a platform for innovation.

Vinton Cerf

Widely known as a "Father of the Internet," co-designer of TCP/IP protocols and basic architecture of the Internet

Introduction

Guess how is it possible to see the latest news, cricket, talk to our friend, check availability of railway reservation, timings or status of a particular flight, send or receive mails/messages as and when we wish to. Yes, it is possible through the Internet, where all this happens like magic on few clicks of the mouse. Millions of people across the globe are able to communicate and interact with each other through the Internet. All we need for this is an Internet connection on any computing device like Desktop, Palmtop, Laptop, Mobile Phone, etc. Applications of the Internet have covered almost every field – be it education, research, entertainment, communication, science, commerce, shopping, advertising and many more.

The Internet is possible because of the ability to interact and share information between the

computers connected through a ***network.*** The Internet is often called the *Network of Networks* (Figure 7.1) which enables us to interact and communicate with each other.

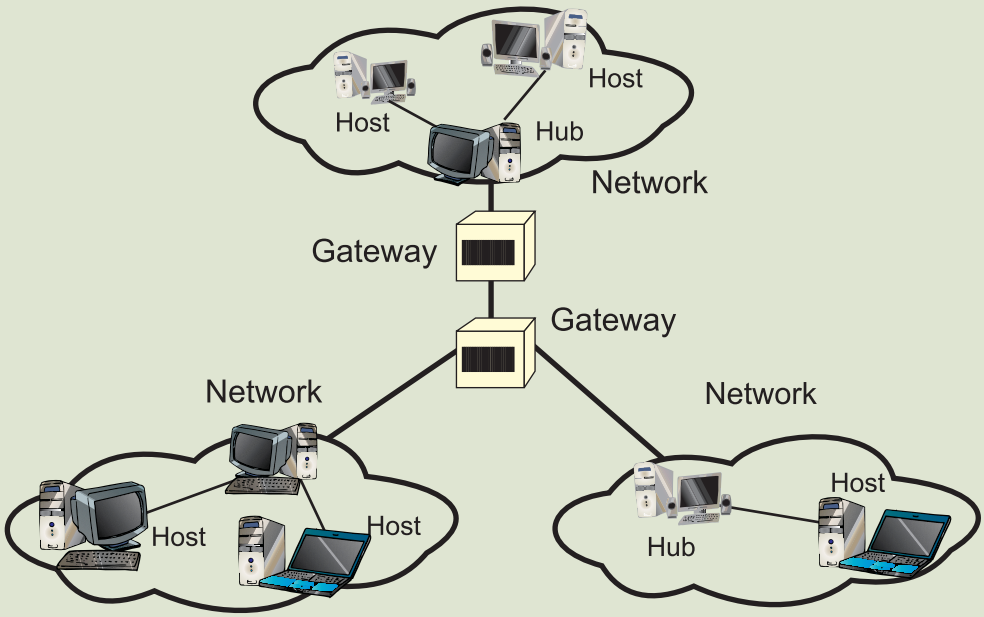


Figure 7.1 : Network of networks

7.1 HISTORY OF THE INTERNET

The Internet was not developed within a period of a few days or a few months. Rather, it is the result of a long and aggressive research which took many years.

In 1969, the American Department of Defense (DOD) started a network of devices called ARPANET (Advanced Research Projects Administration Network) with one computer in California and three in Utah. In September 1969, the University of California at Los Angeles (UCLA), the Stanford Research Institute (SRI), the University of California, Santa Barbara (USCB) and the University of Utah were connected by a network that was called the ARPANET. As the use of the network gradually increased, other universities, research organisations, and private and commercial organisations also started using this technology.

The Internet, often referred to as the 'Net', consists of a complex network of computers connected by high-speed communication technologies like satellites, microwave devices, etc. It allows easy and quick access to a huge amount of information/resources stored at many different locations around the world. The actual term "Internet" was finally coined in 1995 by the FNC (Federal Networking Council, USA).

7.2 HOW THE INTERNET FUNCTIONS?

A corporate network may have its computers connected through a local area network, governed by certain rules. Further, this network may be connected with other networks. But, if different networks are governed by different rules, will they be able to communicate with one another? Imagine a group of people having one Tamilian, one Bengali, one Himachali, one Mizo and one from Maharashtra trying to communicate with each other in their own native languages, failing to understand what the other person is trying to say. Therefore, to communicate with each other, some common standard must be followed.

Functioning of the Internet is not controlled by any one particular organisation. It is managed by a group of voluntary organisations. These voluntary organisations have formed the Internet Society. They decide on the rules, known as *protocols*, for communication over the Internet. The different networks may have their own rules that they follow internally, but when they communicate with each other, they must follow some common rules. It's like we speaking our mother tongue at home, but while communicating in a mixed group, we use a common language, mainly, Hindi or English.

7.3 HOW TO WORK WITH THE INTERNET?

In order to work with the Internet we need to know certain related terms like www, web browsers, web pages, websites, etc. We should know how to get connected to the Internet. Once connected – how to use it.

Most of the terms on the Internet are prefixed with the term web. The electronic pages seen on the Internet are known as ***web pages.*** A web page can be defined as the document that we see on the Internet. Many web pages linked with each other combine to form a ***website.*** A web page can be written in the language known as ***HTML (Hyper Text Markup Language).*** HTML is a very simple language having a number of options to represent text. Many other scripting languages have now been developed which can be embedded into HTML, giving it the power to interact with the users. (These are discussed in detail in the next Unit). These dynamic web pages can take inputs from users and give information accordingly – taking in the location of the user before displaying the weather forecast. For example, a protocol called Hyper Text Transfer Protocol (HTTP) is used to transmit and receive the web pages.

7.3.1 Web Browsers

The web is a collection of a huge amount of information. Every single web page consists of some information and also a number of links, which connects us to other related web pages. To visit the linked web pages, just click over the linked text and the next web page opens up.

Just like a word processing application is needed to open a word processor document, an application is needed to view an HTML document. To view a web page we need special software called ***web browser.*** Mosaic was the first web browser developed by National Centre for Supercomputing Application (NCSA). This browser didn't have any special features like present day web browsers. It was not possible to view pictures or use any present day font formatting features in the web pages. Initially, the browsers were designed to show plain text, without any formatting.

With the increasing use, the need to incorporate additional features like text formatting, viewing images, playing sound, etc. was felt. Most modern day browsers incorporate all these features. Some other commonly used browsers are Netscape Navigator, Mozilla FireFox, Opera, Safari, MSIE (Microsoft Internet Explorer), etc. Almost all of these support a common set of rules of the language. Some browsers are shown in figure 7.2.



Figure 7.2 : Web Browsers

Mozilla Firefox is an open source web browser which is available free of cost and can be easily downloaded from the Internet. Open source software does not require any license fee.

7.3.2 WWW (World Wide Web)

One Internet application that is currently drawing a lot of attention is the World Wide Web (WWW), also known as W3. WWW is a hypermedia based software technology allowing consolidation of hypertext, graphics, audio, video and multimedia to provide information on almost each and every topic/subject/area.

WWW was started in 1989 at CERN (European Center for Nuclear Research). The motivation was the need to interact with each other by the group of researchers at far off places. This demand for interaction and communication led to the rapid growth in this area of communication.

Any website located on the Internet has an address associated with it indicating the location of the website. Every page has an address associated with it. This address is known as the URL.

7.3.3 URL (Uniform Resource Locator)

URL stands for Uniform Resource Locator. Every web page that is displayed on the Internet has a specific address associated with it. This address is known as the URL. It tells us the location of the web page being displayed and other related information.

As the postal address is required to reach a letter to a person staying anywhere on earth, a unique location (address) of a web element which may be a website or a web page is required in the World Wide Web to view it in the browser. This unique address of the web elements is referred to as a URL. The URL consists of four basic parts, namely, server type, hostname, folder name and the filename. Each one of these has a specific function. The "server type" indicates the type of Internet server (Protocol) being accessed. The server **type** is always followed by **"://"** and the host name. The host name is the Internet address of a remote computer on which the files reside. The folder name indicates the name of the directory in which the files are located. The filename specifies the name of the specific document to be displayed in the browser. The filename itself consists of two pieces of information, the name of the file to be displayed and the file extension, which specifies the file type (.htm for HTML file, .txt for a text file, .bmp for a bitmap image, etc.)

The structure of a URL can be represented as follows:

Server type://Hostname/directory/sub-directory/.../filename

A URL is illustrated in figure 7.3.

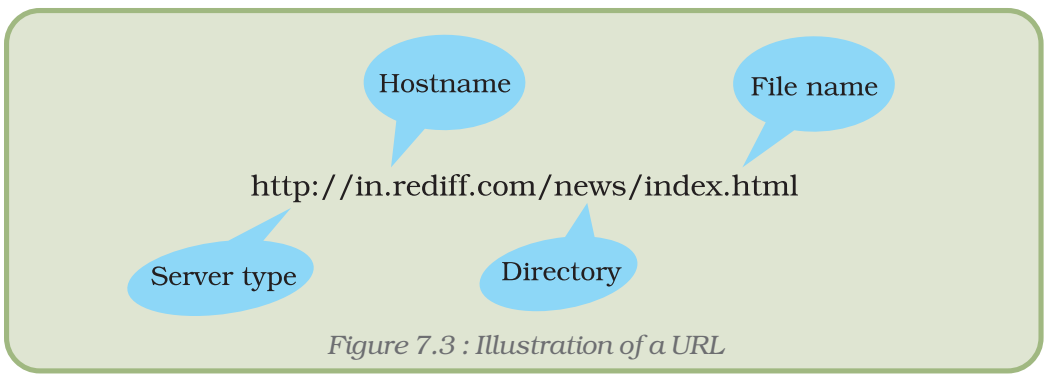


Figure 7.3 : Illustration of a URL

Many other protocols exist apart from http. Table 7.1 lists some common protocols.

Table 7.1 : Some protocols with their usage

Name	*Used for*
http	*Hyper Text Transfer Protocol is used to transfer the hypertext*

ftp	*File Transfer Protocol is used to transfer binary and text files over the Internet*
file	*Local file*
news	*News group /News article*
telnet	*For remote login over a TCP/IP connection*
TCP/IP	*Transmission Control Protocol Internet Protocol. TCP/IP consists of a set of two protocols i.e. Transfer Control Protocol and Internet Protocol. Transfer Control Protocol controls the flow of data and is a reliable service protocol. Every computer in a network has a unique IP address associated with it. IP identifies and reach the target computer on the network.*
UDP	*User Datagram Packet is used to transfer data between two computers. It is an unreliable protocol, offering no guarantee for data delivery.*

There are other protocols also like SLIP (Serial Line Internet Protocol), SMTP (Simple Mail Transfer Protocol) ARP (Address Resolution Protocol) PPP (Point to Point Protocol), etc.

7.3.4 Connecting to The Internet

In order to activate Internet services on any computer, it requires an Internet connection from an Internet Service Provider. There are several Internet Service Providers (ISPs) in India like VSNL, BSNL, Airtel, Reliance, etc. They charge some nominal fee for installation and connection. Depending on the requirement we can get an Internet connection in any of the following ways:

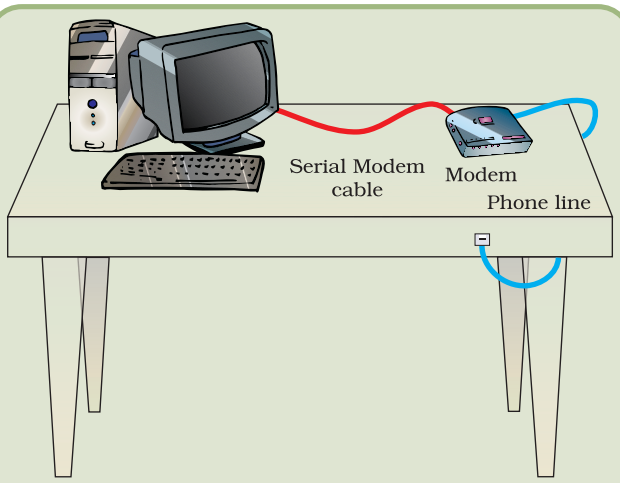


Figure 7.4 : Set up for Internet connection

1. Dial-up connection : We can get connected to the Internet by dialing the ISP's number. This is useful if the network is either confined to small group of computers or for a single PC (Figure 7.4).
2. Leased lines : A dedicated line is laid specifically for the connection. This provides a fairly high speed, but is expensive. This is suitable for an organisation requiring uninterrupted, high speed Internet connection.
3. Broadband : This also provides a good speed. While leased line requires a separate telephone line, broadband can be delivered using an existing telephone line. This is ideal for home and small businesses requiring high speed Internet.

4. ***WiFi Broadband*** **:** These days even wireless connections are available. For this we need to have a W*i Fi* card attached to the computer and a wireless modem.
5. When we connect to the Internet we must know its speed parameters. The speed of the Internet is measured in the number of bits transferred per unit time. Generally, the speed of the Internet is measured in kbps (kilo bits per second), but these days some organisations are providing high speed connections in Mbps (Mega bits per second).

Bandwidth **:** In context of the Internet, the number of bits transferred by a channel per unit time is the bandwidth.

In order to have a connection we need a device called the modem. This device converts the digital signal from the computer into an analogue signal that can travel through the telephone line. On the other end, this analogue signal is again converted back to digital form by the modem at the destination end. Some computer systems have internal modems (built-in within the motherboard) while in some systems there might be a need to have an external modem to have an Internet connection.

Another device called a router can be attached to the computer to access the Internet. The router is a device used for connecting two different networks.

7.3.5 Domain Names

All the websites on the Internet have unique names associated with them. To launch a website, we must have a unique domain name. In order to avoid any conflict within the names of the websites the concept of domain names was developed.

There are certain websites which have .ac which indicates academic organisations, .in suffixed to their name indicating that they belong to India, for example: www.ignou.ac.in, www.ncert.nic.in, and many more. websites having .au as a suffix indicate Australia, .jp indicates Japan and so on. However, there is no such suffix for USA.

A domain can be generic or according to the names of the country. Some common domain names are:

1. in – stands for India (country name)
2. gov – indicates government agencies
3. net – network organisations
4. org – non-profit organisations
5. edu – educational organisations
6. com – commercial organisations
7. mil – military or defence

7.4 USES OF THE INTERNET

The Internet is extensively used for a wide variety of purposes. Some of these are mentioned below:

7.4.1 Search 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.

Search Engines

A search engine is a complex program that searches documents containing a specified set of keywords. A search engine basically works in three phases:

1. *The search engine sends a program (called the spider) that searches the web pages in the Internet for the keyword.*
2. *After the spider fetches the result, another software called the indexer reads these results. The indexer then creates an index based on the words contained in each of the documents returned by the spider.*
3. *After indexing, the search engine presents only the documents matching the search criteria to the user.*

The relevance of the result returned by the search engine depends on how you frame the query. To search any information, connect to any of the searchengine websites like: www.msn.com, www.google.com, www.webopedia.com, www.yahoo.com and follow the points mentioned below:

1. *Enter the keywords of the topic for which the search is required in the input box. For example, if a search is required on population then enter the keyword as "Population" or "population"*
2. *Search for the phrase is done by entering the phrase within the double quotes. For example, if the search is required on declining sex ratio then the keywords can be entered as:*
   "declining sex ratio."
3. *Notice that the phrase to be searched has been given in double quotes. If double quotes are not entered then search will be made for individual keywords. Any document containing any one of the keywords will be returned.*
4. *The search can be made simultaneously for more than one word by placing a space or 'OR' within the keywords.*
5. *If a search is to be made for a set of words in a desired sequence then these set of keywords can be given in double quotes.*

7.4.2 E-Mail (Electronic Mail) Services

The Internet is commonly used for sending and receiving e-mails. We can send a message electronically to any person on the globe, provided that person has an e-mail-id. This service is fast and economical.

7.4.3 Chatting

Chatting involves textual exchange of message in real time. Chat servers provide facility to create virtual chat rooms and only the members associated with these rooms are allowed to share messages. Chat works best if the time is scheduled by both the parties who are willing to chat – as both the parties must be connected to the Internet while chatting. Some common chat engines are : Yahoo Messenger, Google Talk, Rediff Bol, etc.

7.4.4 Instant Messenger Services

These tools can be used to send messages instantly. It also allows us to talk to anyone anywhere in the world. This is a cheaper and quicker method compared to other services. Unlike chatting, it is not necessary to have an account with the same provider. Additionally, both the users need not be connected while sending messages. We can easily download the messenger software from Internet e.g. MSN Messenger, Yahoo Messenger, etc.

7.4.5 Newsgroup

Newsgroup is an e-service hosted by many newsgroup organisations. One can become a member of a newsgroup and read and share current affairs and messages. Newsgroups cover a broad domain of interests including education, science and technology, medicine, arts, sports, etc. USENET is one such example.

7.4.6 Teleconferencing

People can have a conference or meeting sitting at different locations with a microphone attached to their computers.

7.4.7 Video-Conferencing

In teleconferencing we are able to talk to each other sitting at different places but in video-conferencing we can also see what is happening at the other side. We have observed that the anchor, panelists and experts sitting at different locations across the globe communicate and share their views in many news channels. For this, we need a web-camera and a microphone connected to the computer system, high bandwidth connection, and video-conferencing software.

7.4.8 E-Commerce

E-commerce or Electronic-Commerce means online transactions of business. In this, the vendor and customer conduct a transaction sitting at different geographical locations, connected through the Internet. The customer need not strain himself by visiting a number of shops outside in scorching heat or heavy rains. He can do shopping by sitting at home, visiting the desired e-commerce site and placing an order

online. E.g. http://shopping.indiatimes.com, http://ebay.com, http://shopping.rediff.com, etc.

7.4.9 M-Commerce

It is an acronym for *mobile commerce*. It is an upcoming technology after e-commerce. It involves buying and selling of goods and services electronically through wireless handheld devices at any place. We can do transactions through our mobile phones also.

7.5 HOW TO MANAGE AN E-MAIL ACCOUNT

7.5.1 E-Mail Address

An e-mail addess (account) consists of two main parts, the username and the domain-server name with the symbol @ in between.

<username>@<domain-name>

Username can be any name but domain-name is fixed for a particular website on which we have our e-mail account. For example, dceta.ncert@nic.in, xyz@nic.in or abc@yahoo.com, etc.

7.5.2 Configuring E-mail Account

We can easily make our e-mail account by visiting websites which provide this service. Many websites like www.indiatimes.com, www.rediffmail.com, www.hotmail.com provide free as well as paid e-mail services. For creating an e-mail account on the Google website we have to follow the steps given below:

1. Log on to the website by typing www.google.com and then select Mail option or simply type www.gmail.com (Figure 7.5)

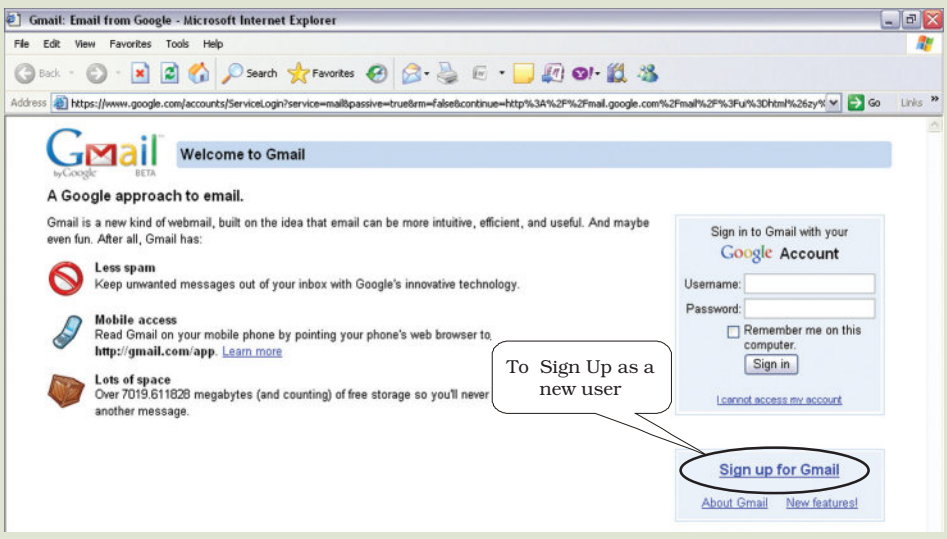


Figure 7.5 : Logging on to google for creating e-mail account

2. Click on the option 'Sign Up' or 'New User'.

A web page containing a form opens up in the browser (Figure 7.6). Fill in the form with details and click the option '*Register Me*' or '*Confirm*'.

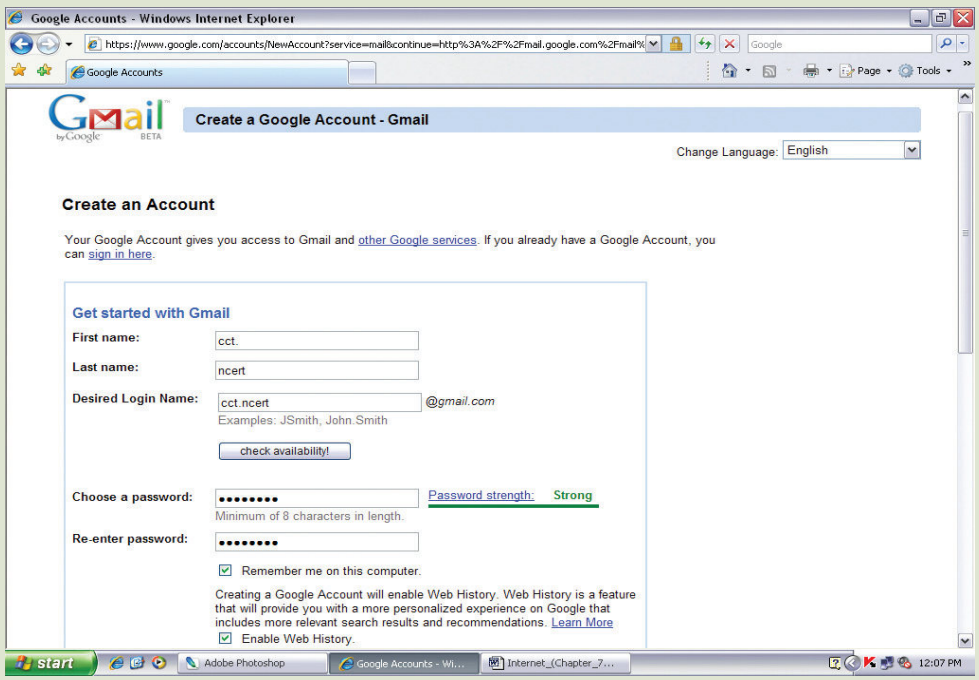


Figure 7.6 : Create an account dialog box for gmail

If the details filled are NOT according to the questions asked then the host website shows an error message. An error will also result if the e-mail address you are attempting to make is already used by someone else. Each e-mail address is a unique address.

1. After the e-mail address has been created, the host website will congratulate and show a welcome screen and then will move on to our account (Figure 7.7).

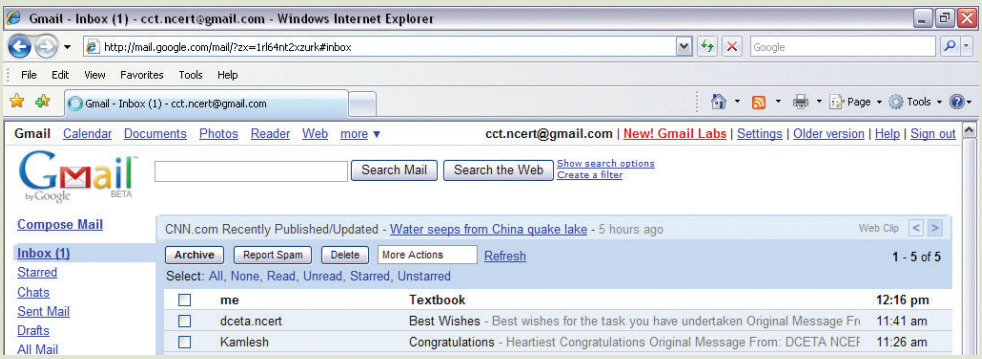


Figure 7.7 : Inbox showing a mail from the host website

7.5.3 How to Log to an E-Mail Account

To send or receive mails, we have to login to our e-mail account as follows:

- Open the website and type in the e-mail id and the password in the textboxs for user and password respectively (Figure 7.8).

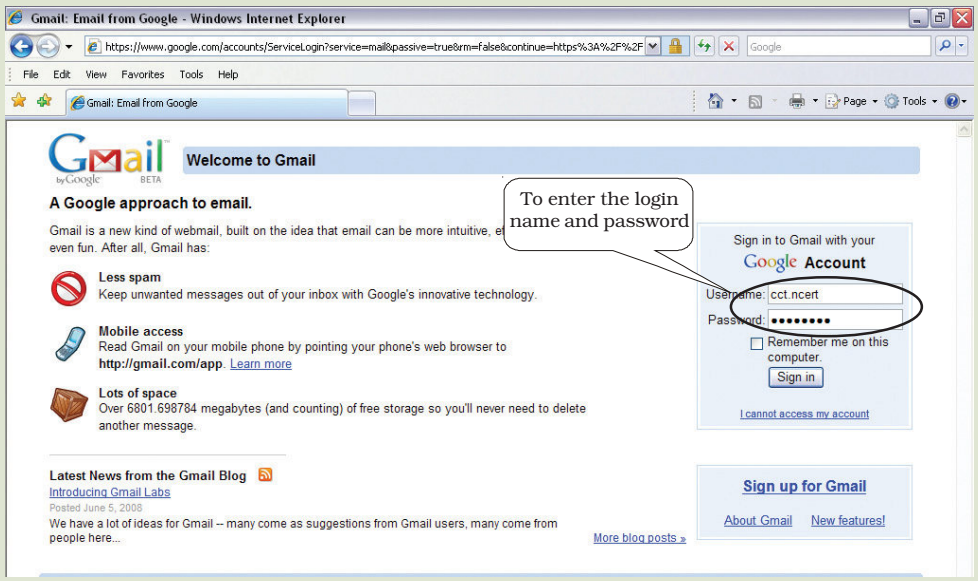


Figure 7.8 : Login into an e-mail account

- Click on '*sign in*'. We are now logged in provided we have typed in the correct e-mail-id and password.

Once logged in, we may expect a web page which looks similar to the one shown in Figure 7.9.

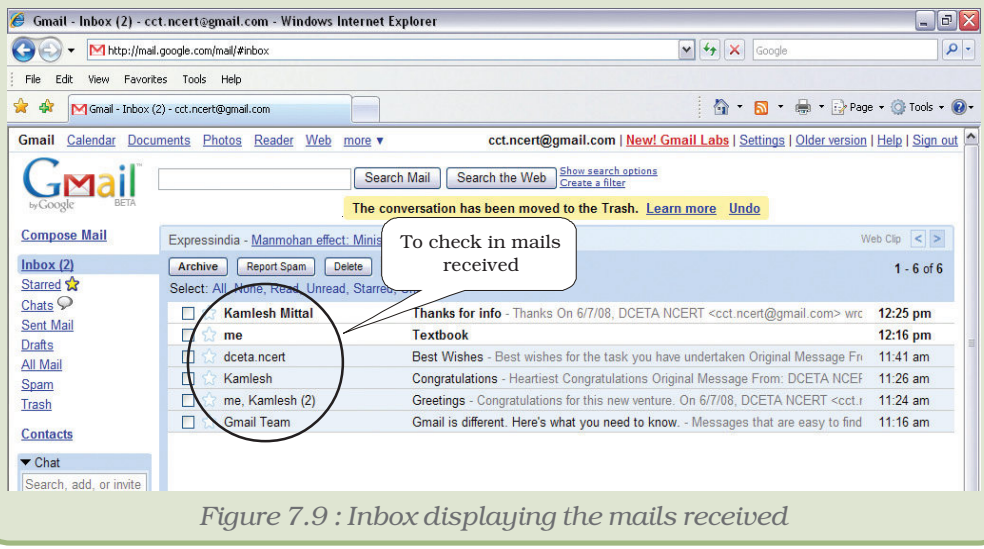


Figure 7.9 : Inbox displaying the mails received

7.5.4 Receive Mails

To see the mails received, click on Inbox. A number against the Inbox indicates the number of unread mails. Once the Inbox is open, we shall see all the mails listed there. To read a mail, we need to just click on the mail that we wish to read.

After going through the mails we can either let them remain in our account for future reference or we can also delete the same. There are options for deleting or transferring them to trash. Trash is a folder where we keep the mails to be deleted.

7.5.5 Sending E-Mails

To send an e-mail, both the sender and receiver must have an e-mail account. To send an e-mail, follow the steps listed below:

1. Click on the 'Compose' option.
2. Enter the e-mail address of the receiver against any of the three options - *To* , *CC* and *BCC*.
   - *To*: Address(es) mentioned in this box are visible to every receiver.
   - *CC*: stands for Carbon Copy. The mail will be sent to the *To* address as well as *CC* address. The addresses typed in *To* as well as in *CC* are visible to all other receivers.
   - *BCC*: Stands for Blind Carbon Copy. Each user whose addresses are typed in *BCC* is unaware of the fact that the same message has also been sent to others.

Instead of typing in the address, we can also insert the same from the address book (Section 7.5.7) :

1. Click Insert Address or Address Book.
2. Select the addresses by Checking (ticking) them.
3. Click OK or Insert option to insert the address in the recipient mailbox.

3. Write in the message in the text box as indicated in the figure
4. After typing in the message click on *send* option as indicated in the figure 7.10.

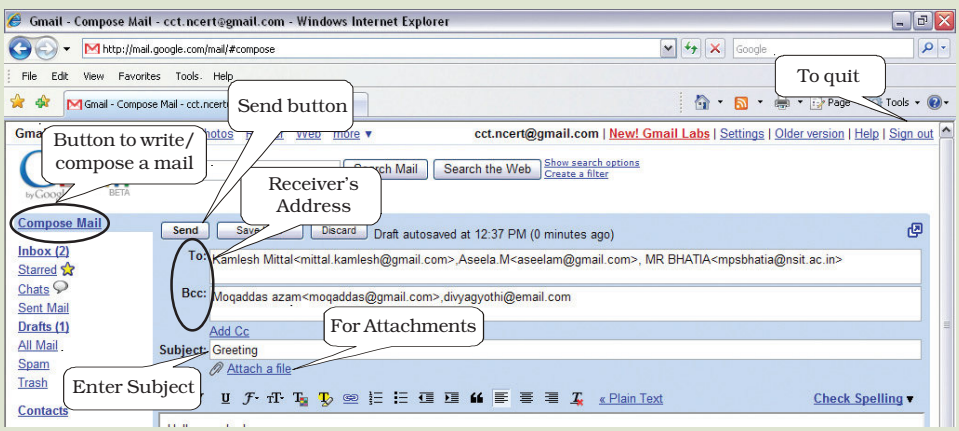


Figure 7.10 : Sending mail

In order to close the e-mail session, we can click on options like *logout* or *sign out*.

7.5.6 Sending Files as Attachments

An e-mail can contain other files attached to it. Files can be attached using the following steps:

1. Click the *Compose* button.
2. Click *Attach a file* button (Figure 7.11).
3. Click *Attach another file* to attach more than one file (up to a certain limit set by the website).
4. Type in the other details like receiver's address and the textual message and click the *Send* button (Figure 7.10).

Once an e-mail account has been created, we can check the mail from any place anywhere in the world, provided we are connected to the Internet.

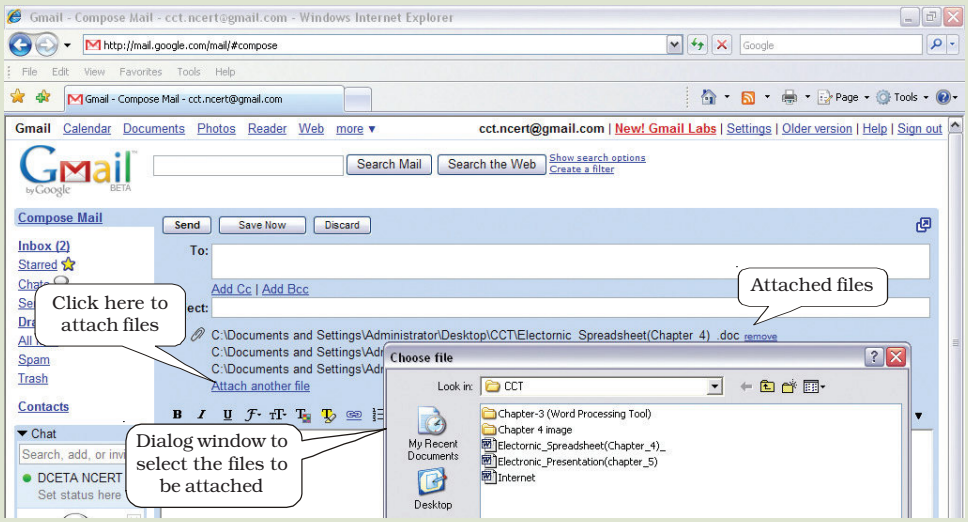


Figure 7.11 : Selecting and attaching files to be e-mailed

7.5.7 Address Book

Just like we store the address of our friends and relatives in an address diary, the host website provides us the facility to store e-mail addresses of our contacts.

Add Contact

1. Click on the *Contacts* option.
2. Click on *Create-Contact* button to add any new contact.
3. Fill in the details and click on *Ok*, *Add* or *Save* button (different sites may provide different options).

Figure 7.12 shows all the contacts of the user.

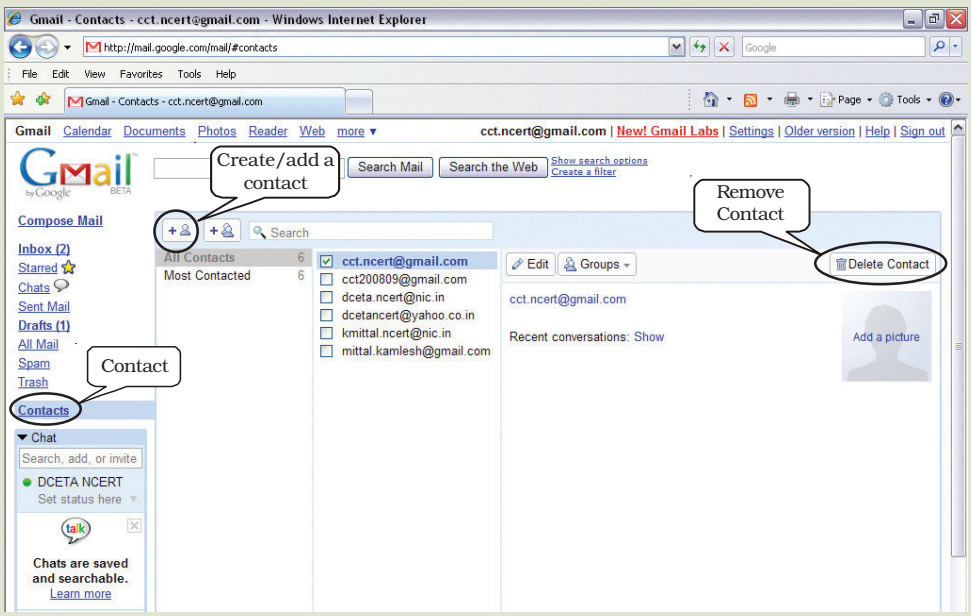


Figure 7.12 : Address book

Remove Contact

To remove a contact from the address book,

1. Click on the *Contacts* option.
2. Select the addresses to be deleted by clicking on them.
3. Click *Remove* or *Delete* Button to remove the selected contact(s).

7.6 DOWNLOADING FILES

While working on the Internet, any web page can be seen in the browser window only after it has been copied to the main memory of the computer. This process of copying web pages from the Internet to the computer is called downloading. Apart from the web pages which are downloaded whenever we type in the address or click on its link, we can also download files from the Internet.

7.6.1 How To Download Files?

One popular use of the Internet is downloading software files and their updates. There are a number of ways in which a file can be downloaded:

- There may be a *download* button which can be clicked. Click and follow the instructions that appear on the screen for downloading the particular software.
- A web page can be saved by selecting '*Save*' or '*Save As*' option.
- Right click a link and then choose the option '*Save Target As*' (Figure 7.13).
- Hold the *Shift* Key and click the link. This opens up another download window from where we can save the file.



Figure 7.13 : Downloading a file

The above image shows the popup menu which appears when one right clicks a hyperlink. The *'Save Target As'* is the selection needed for saving.

Some files may be in compressed form having extensions like .zip, .tar, rar, etc. Such files need to be decompressed after downloading using software meant for this purpose. An example of such software is WinZip.

Apart from downloading files, we can also ***save some pictures or texts***.

1. To save pictures:
   (a) Right click on the picture.
   (b) Choose the option *'Save picture'* from the popup menu.
   (c) Save the picture at the desired location when the dialog box gets opened up.

> ***Note :*** Picture or file can be saved with the same name as provided by the website or using a different name.

2. To save the text:
   (a) Entire text from a web page can be copied to a word processor file by choosing *Select All* option from *Edit* menu. Choose *Copy* option from *Edit*. Open a blank document file in the word processor and select the *Paste* option from the *Edit* Menu.
   (b) To copy only a part of the text from a web page, select the text or matter to be copied. Once selected open a blank document and paste as above.

2. We can directly set the picture seen on the Internet as the background image of our computer. Right click on the picture and select the option *'Set As Background'*.

7.7 E-SERVICES

There is a wide range of services provided by the Internet like search engines, chatting and e-mail which we have discussed before, others are e-banking, e-learning, etc. which are discussed below.

7.7.1 E-Banking

Almost all the nationalised banks have started providing their services online. This means you can have a bank transaction through Internet. E-banking is a facility that allows you to conduct your banking transactions online with a laptop or computer with an Internet connection. Every user is allotted a unique user id and password by the bank for this purpose.

The account holder can view account balances and transaction statements, transfer money between accounts in the bank, pay utility bills at any time of the day and from any place, can take printouts of financial-statements, and many more.

7.7.2 E-Learning

E-learning deals with educating people online with the help of the Internet. Development in this field has led to the formation of virtual classes and online sessions. A teacher can teach many students at the same time sitting at different geographical locations. Such classes may be open to all, or may require prior student registration.

> *"... the effective teaching and learning process created by combining e-digital content with local community and tutor support along with global community engagement."*
>
> *http://cbdd.wsu.edu/edev/Kenet_ToT/Unit1/WhatseLearning.htm*

E-Learning can be delivered in different ways:

1. At the time of learning teacher and students both are to be online.

Video Lecture : The teacher or instructor can take a class while students can see and listen to him/her. For such a classroom a web camera is required at every terminal.

Textual Lecture : The teacher can take a class by passing his lectures as text and students providing textual response. Students can post their queries online and can get the response instantly.

2. At the time of class both teacher and student need not be online at the same time.
   (a) The teacher can send the lecture using tools like explain these and blogs online to the students.
   (b) The students can read their lessons online. If they have any queries then they can mail their queries to the teacher's account.

Summary

- The Internet is a net consisting of complex network of computers connected by high speed communication technologies.
- The Internet has penetrated and benefited every field – be it education, sports, news, business, etc.
- A web page can be designed using HTML.
- The Internet has converted the world into a global village.
- The Internet has led to faster globalisation. A web page is an electronic document that we can see on the Internet.

- Web browser is software required to view web pages.
- Mosaic was the first web browser.
- www is stand for World Wide Web.
- Electronic mail can be sent and received through any e-mail account.
- Downloading is saving of files from the Internet to our computer.
- Attachments are the extra files that we can send with our email.
- E-commerce stands for electronic-commerce which means buying and selling over the Internet.
- M-commerce is an emerging field which stands for mobile commerce.
- Teleconferencing is having online conference with the facility of exchanging thoughts using an audio.
- Videoconferencing means having online conference with the facility of seeing and listening to other participants.

EXERCISES

Short Answer Type Questions

1. Write steps for adding a contact to an email account.
2. What is the Internet?
3. What is the full form of ARPANET?
4. What is the acronym for electronic mail?
5. Define e-commerce.
6. What do you mean by the term m-commerce?
7. What do you mean by the term protocol?
8. What is e-banking?
9. Describe the term e-services.
10. What is a modem?
11. What is a router?
12. Differentiate between e-commerce and m-commerce.

Long Answer Type Questions

1. Who governs the Internet? Discuss in detail.
2. Explain any three applications of e-commerce.
3. Explain any three applications of m-commerce.
4. How would you add an address in an address book?

5. Explain the use of the Internet in our daily lives.

6. Write down the steps required to create an e-mail account.

Multiple Choice Questions

1. Modem speed is measured in
   (i) Gbps
   (ii) Tbps
   (iii) Kbps
   (iv) Pbps

2. URL stands for
   (i) Uniform Research Limited
   (ii) Uniform Resource Locator
   (iii) UniLine Resource Labs
   (iv) Uniform Research Locator

3. Field involved in adding mobility to the area of commerce
   (i) Mobile Business
   (ii) M-Commerce
   (iii) Hand to hand commerce
   (iv) Mobile Communication

4. Learning online through Internet is also known as :
   (i) E-teaching
   (ii) Virtual classes
   (iii) E-learning
   (iv) Videoconferencing

5. E-commerce, e-learning, e-banking, m-commerce are some of the
   (i) e-services
   (ii) Internet services
   (iii) User services
   (iv) Business services

Activities

Activity 7.1

- Create an e-mail account on any one of the websites (for example www.gmail.com, www.yahoo.com, www.indiatimes.com, www.rediffmail.com, etc.)
- Add the email addresses of your friends in the address folder.

Activity 7.2

Send an e-card to your friend on his/her birthday (you can search for e-cards on websites like : www.123mountaingreetings.com, etc)

Activity 7.3

You have to write a mail to your friend as a reply for the mail received from him. Try replying to your friend using the option 'Reply' present on your email account. This option can be seen on the top of the mail-box. How does this method differ from the normal method of reciprocating?

Activity 7.4

You have received an e-mail that is very interesting or informative. You want to send this mail to other friends as an email. Try to send this mail to other friends using the option 'Forward' present on the top of the email account.

Activity 7.5

'E-Teaching' is an upcoming learning tool. Surf for e-learning sites on the Internet and create a report.

Activity 7.6

Trace your location on the globe using programs like Google Earth,

APPENDICES

Appendix 7.1 : To Create an E–Mail Account

1. Click on the option 'Sign Up' or 'New User'.

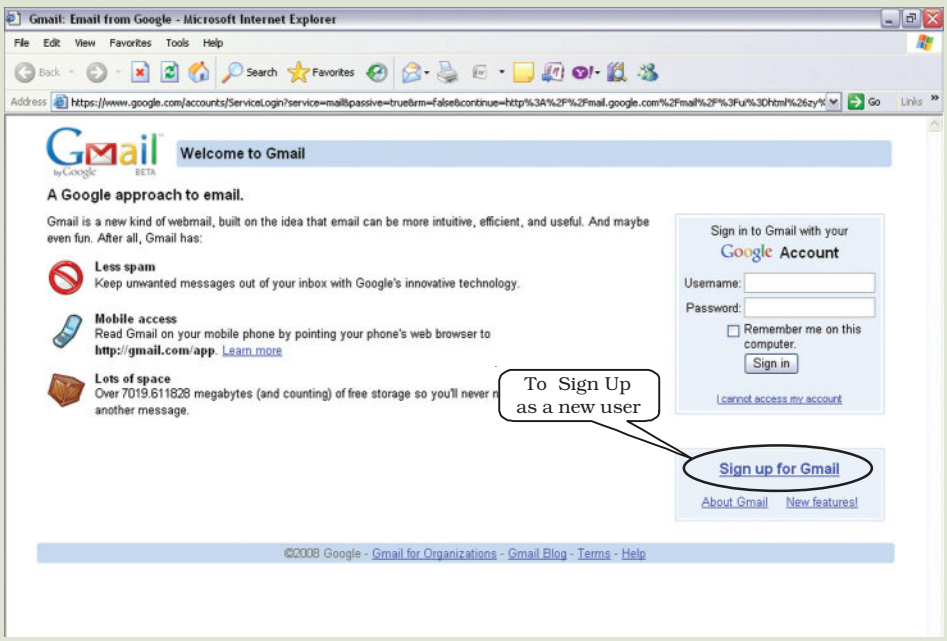


Figure 7.14 : Logging on to Google for Creating email account

2. A web page containing a form opens up in your browser. Fill in the form with details and click the option '*Register Me*' or '*Confirm*'.

If the details filled are not according to the questions asked then the host website shows an error message. An error will also result if the email address you are attempting to make is already used by someone else. All email addresses must be unique.

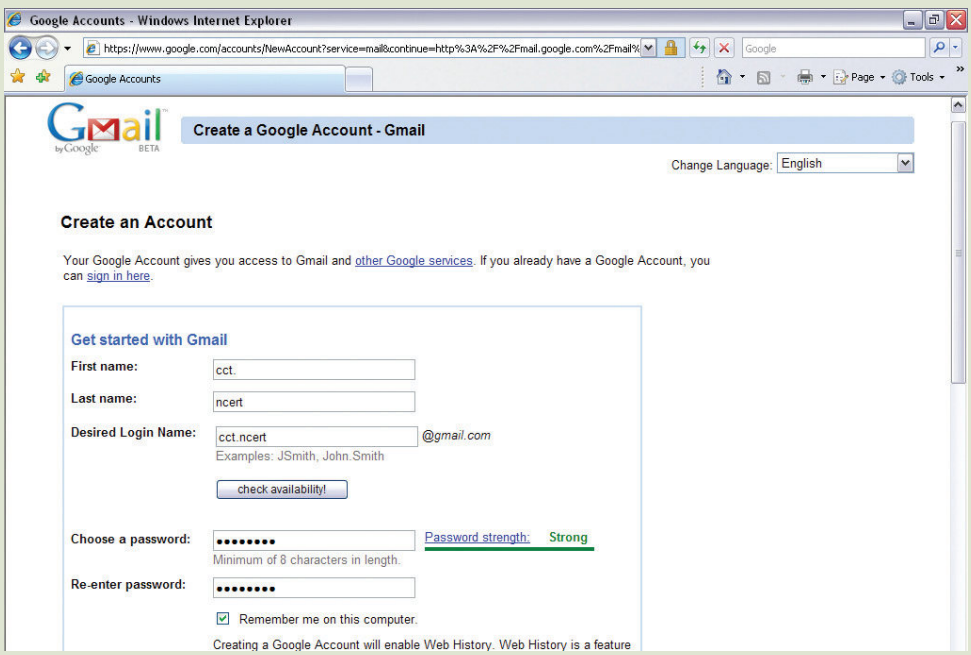


Figure 7.15 : Create an account dialogue box

3. After the email address has been created, the host website will either congratulate you/show a welcome screen and will move on to your account.

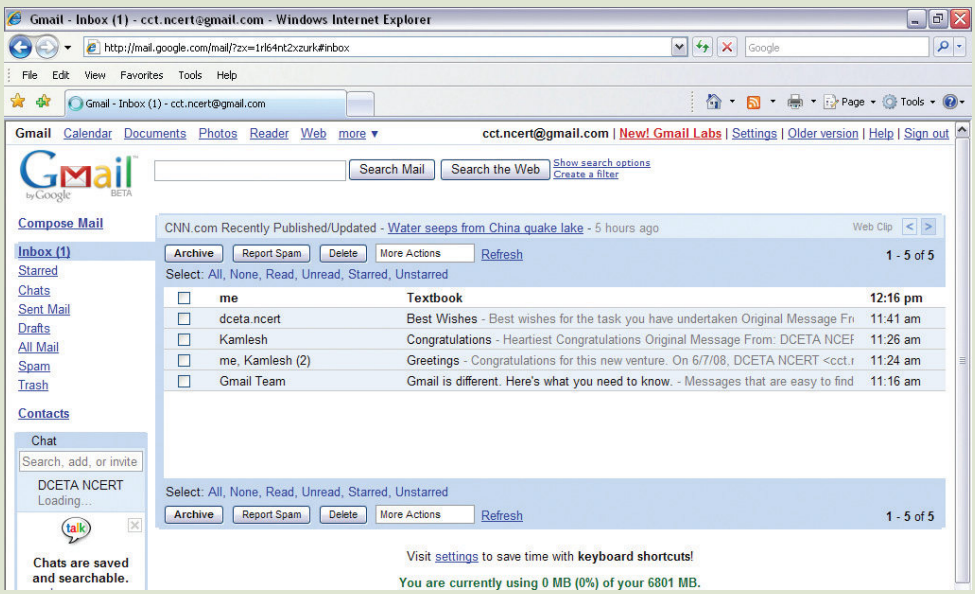


Figure 7.16 : Confirmation of the account created in the inbox

Appendix 7.2 : Simple Mail Transfer Protocol

Simple Mail Transfer Protocol is a TCP/IP protocol used in sending and receiving e-mails. However, since it is limited in its ability to queue messages at the receiving end, it is usually used with one of two other protocols, POP3 (Post Office Protocol 3) or IMAP (Internet Message Access Protocol) that let the user save messages in a server mailbox and download them periodically from the server. In other words, users typically use a program that uses SMTP for sending e-mail and either POP3 or IMAP for receiving e-mails. On Unix-based systems, Sendmail is the most widely-used SMTP server for e-mail. A commercial package, Sendmail, includes a POP3 server. Microsoft Exchange includes an SMTP server and can also be set up to include POP3 support.

SMTP is usually implemented to operate over Internet port 25. An alternative to SMTP that is widely used in Europe is X.400. Many mail servers now support Extended Simple Mail Transfer Protocol (ESMTP), which allows multimedia files to be delivered as e-mails.

Appendix 7.3 : Point-to-Point Protocol

The Point-to-Point Protocol, or PPP, is a data link protocol commonly used to establish a direct connection between two nodes over serial cable, phone line, trunk line, cellular telephone, specialized radio links, or fiber optic links.

PPP also established a standard for the assignment and management of IP addresses asynchronous (start/stop) and bit-oriented synchronous encapsulation, network protocol multiplexing, link configuration, link quality testing, error detection, and option negotiation for such capabilities as network layer address negotiation and data-compression negotiation. PPP supports these functions by providing an extensible Link Control Protocol (LCP) and a family of Network Control Protocols (NCPs) to negotiate optional configuration parameters and facilities. In addition to IP, PPP supports other protocols, including Novell's Internetwork Packet Exchange (IPX) and DECnet.

Soft Skills for Effective Communication

8

Objectives

After completing this Chapter, the student will be able to:

- *identify various soft skills,*
- *understand the structure and processes of effective communication,*
- *relate soft skills with effective communication,*
- *write clearly and concisely,*
- *communicate effectively, build rapport and relate well with all kinds of people,*
- *facilitate and support the professional growth of others,*
- *focus efforts energetically on meeting a goal, mission or objective,*
- *utilise logical, systematic and orderly procedures to meet objectives,*
- *work effectively and productively with others and*
- *prepare an action plan to improve effectiveness of his/her communication.*

"Think like a wise man but communicate in the language of the people."

William Butler Yeats

Nobel Prize winner for literature in 1923 and founder of the Irish National Theatre Company at the Abbey Theatre, Dublin.

Introduction

Having knowledge, i.e itself is not enough, we need to communicate it to others effectively. In fact effective communication is one of the keys to success. By successfully getting our message across, we convey our thoughts and ideas effectively. The message is the information that we want to communicate. It is essential to be technically sound, but we should also have the ability to express and communicate our ideas clearly and effectively to others in the simplest possible manner. Effective communication and soft skills not only improve our relationships with others, but they also improve our efficiency.

We have learnt in earlier chapters what communication is and how messages can be communicated through various technical skills (also called hard skills), like electronic word processing/presentation, the Internet, etc., and a few more will be discussed in the next unit on Web Publishing Technologies. In this chapter we discuss what soft skills are and how these could

be used for effective communication in the context of computer/IT mediated communication.

8.1 WHAT ARE SOFT SKILLS?

Soft or social skills (also called non-technical skills) are those personal values and interpersonal skills that determine a person's ability to work well with others in a project team. Soft skills are needed to deal with the external world and to work in a collaborative manner with one's colleagues. These skills include effective communication, leadership, and teamwork skills; demonstrating problem solving abilities, initiative, and motivation skills; displaying honesty and strong work ethics.

Soft skills play a vital role for academic and professional success; they help us excel in the workplace and their importance cannot be denied in the emerging information or knowledge society. Soft skills are needed to deal with the external world and to work in a collaborative manner with one's colleagues.

8.1.1 Types of Soft Skills

There are various components that comprise soft skills. Some are inborn such as confidence, friendliness and whether or not someone has a sociable nature, while others are skills that can be taught or improved upon, such as developing effective communication, organisation, and social graces.

A large number of soft skills are known today. However, a different set of soft skills is required for a specific type/nature of work. For our purpose these may include the following:

- communication skills
- listening skills
- presentation skills
- interpersonal skills
- team skills
- leadership skills
- etiquette
- cross-cultural skills
- language skills, etc.

Some of these are discussed in subsequent paragraphs.

Communication Skills

The ability to communicate ideas to others effectively is an absolute essential requirement for our career building. Speaking clearly and coherently will allow effective verbal communication with others. How we speak is more influential to the person who we are communicating with than what we actually say, so we should be careful about our

body language and tone of our voice when we are talking. Communication is a two–way process. Listening is therefore an essential skill too. Listening is more than just hearing what is being said. Effective listening encourages others to listen to us and respond to what we say. If communication skills are an area that we feel we could improve on, we should set about identifying ways in which we could develop them. Communication subsumes delegation, listening and presentation.

The ability to present comprehensive written ideas will enable us to put forward professional documentation of our thoughts and is a highly regarded skill. If we write so that misinterpretation is minimised we will find that people are far more receptive to our suggestions.

Effective communication skills are something every one needs to possess. Verbal communication skill includes a one-to-one interaction, presentation/public speaking ability, and good telephonic skills. Written communication would include program writing, report writing, letter writing and e-mail etiquette, etc.

8.1.2 How to Develop Soft Skills?

Developing soft skills needs practice. These are acquired and experienced on the spot. Soft skills cannot be acquired by merely reading textbooks. The soft skills we gain equip us to excel in our academic/professional life and in our personal life. It is a continuous learning process.

Development of soft skills has two parts. One part involves developing attitudes and attributes, and the other part involves fine-tuning communication skills to express attitudes, ideas, and thoughts. Perfect integration of ideas and attitudes with appropriate communication skills in oral, written, and non-verbal areas is necessary for successful work. Attitudes and skills are integral to soft skills. Each one influences and complements the other.

8.1.3 Hard Skills vs Soft Skills

Hard skills are technical procedures/tools related to our field. Examples include work place productivity tools (Unit II), computer protocols, etc. These skills are typically easy to observe, quantify and measure. By contrast, "soft skills" are typically hard to observe, quantify and measure. Soft skills complement hard skills, which are the technical requirements. Soft skills are as important, if not more important, than traditional hard skills at our work place.

8.2 COMMUNICATION

We know that communication is to get our message across to others clearly and unambiguously and it is most important for our progress. For this, we must understand what our message is, who the audience

is and how it will be perceived. We must also weigh-in the circumstances surrounding our communications, such as the situational and cultural context.

Information is giving out while communication is getting through.

8.2.1 Effective Communication

Effective communication and interpersonal skills are crucial to the success of an academician as they help him in dealing with people at the emotional level. Effective communication and soft skills not only improve relationships, but also improve efficiency. Communicating effectively is characterised by such things as active listening, using self for messages, conflict management, positive body language, and asking the right questions.

Communicate with confidence, clarity and impact.

8.2.2 Communication Process

The process of communication involves effort from both the sender and receiver of the message. Else the process can be fraught with error, with messages often misinterpreted by the recipient. When the error is not detected, it can cause tremendous confusion, wasted effort and missed opportunity.

Problems with communication can pop-up at every stage of the process. To be an effective communicator and to get our point across without confusion, our goal should be to lessen the frequency of these problems at each stage. This can be done through clear, concise, accurate, and well-planned communications.

The communication process consists of basic components like sender, encoding, channel, decoding, receiver, and feedback and the context.

Sender

As the source of the message, we need to be clear about why we are communicating, and what we want to communicate. We also need to be confident that the information we are communicating is useful and accurate.

Encoding

This is the process of transferring the information we want to communicate into a form that can be sent and correctly decoded at the other end. One must be careful about cultural issues, mistaken assumptions, missing information, etc.

Channel

Messages are conveyed through channels which may be verbal, including face-to-face meetings, telephone and videoconferencing and written, including letters, e-mails, memos and reports. Different channels have different strengths and weaknesses. For example, it is not effective to give a long list of directions verbally.

Decoding

Just as successful encoding is a skill, so is successful decoding (for example, taking the time to read a message carefully, or listen actively). Confusion can arise from errors in encoding as well as decoding. This is particularly the case if the decoder does not have enough knowledge to understand the message.

Receiver

Our message is delivered to individual members of our audience. No doubt, we need to be aware of the actions or reactions we hope our message will get from them. We need to bear in mind, though, that each of these individuals enters into the communication process with his or her own ideas and feelings that will undoubtedly influence their understanding of our message, and thereby, their response. To be a successful communicator, we should consider this before delivering our message, and act appropriately.

Feedback

Feedback is obtained by monitoring response of the receiver to the message. Our audience will provide us with the feedback, may be in the form of verbal and non–verbal reactions to our communicated message (Figure 8.1). Pay close attention to these feedbacks. These feedbacks are the only things that allow us to be confident that our audience has understood our message. If we find that there has been a misunderstanding, at least we have the opportunity to send the message a second time.



Figure 8.1 : An illustration to explain how important feedback is – some illustrations of non-verbal cues reflecting whether the information is well received or not (facial epressions/hand signs/ body gestures)

8.2.3 Communication Models

Various communication models have been proposed for the communication process. The simplest of these, the sender-receiver models are discussed here.

Basic Communication Model

This model (Figure 8.2) is useful when the movement of information across space and through time is a central challenge. Since the model looks at communication from a message point-of-view, its usefulness is limited when the information exchange is so complex that it cannot be isolated into message units.

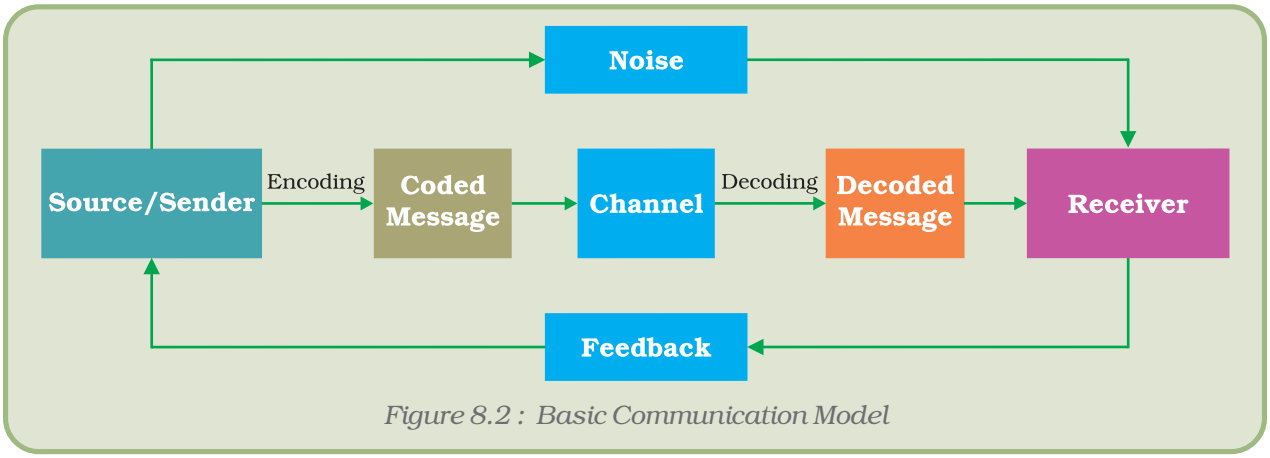


Figure 8.2 : Basic Communication Model

Interaction Communication Model

In a two-way communication/dialogue the source and receiver change positions and messages bounce back and forth (Figure 8.3).

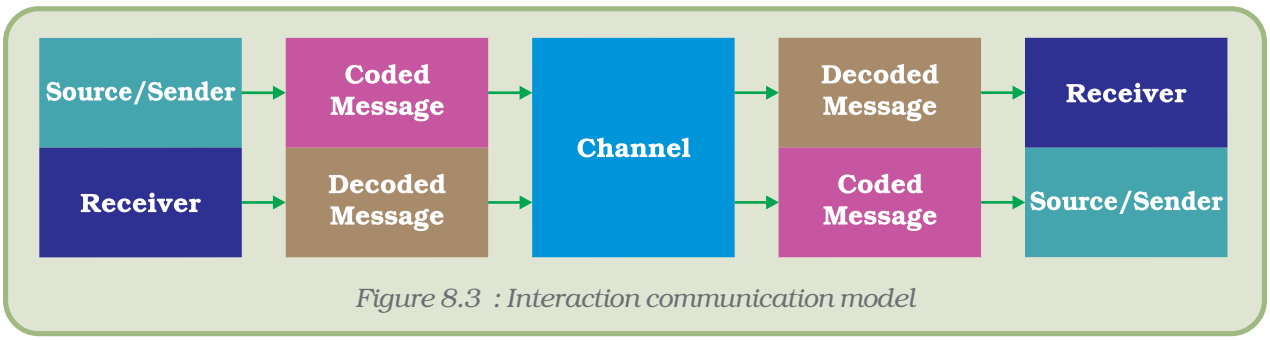


Figure 8.3 : Interaction communication model

The above model can be simplified as shown in figure 8.4.



Figure 8.4 : Interaction communication model (Simplification)

These are successful only when both the sender and receiver understand the same information.

8.2.4 Context

In a communication, there is some minimum shared context. We might be in the same physical location. Even over the phone we have, at the minimum, the commonality of time. When we generate a document paper, usually there is some context embedded in the medium: the text is in the proceedings of a conference, written on a birthday card, handed to our teacher with a batch of too westernised term papers, or something similar.

8.3 COMMUNICATION THROUGH E-MAIL

With e-mail, we cannot assume *anything* about a sender's location, time, frame of mind, profession, interests or future value to us. This means, among other things, that we have to be very, very careful about giving our receivers some context. This section will give specific strategies for doing so.

8.3.1 Useful Subject Lines

A subject line that pertains clearly to the body of the e-mail will help people mentally shift to the proper context before they read our message. The subject line should be brief (as many mailers will truncate long subject lines), does not need to be a complete sentence, and should give a clue to the message contents. For example:

Subject : Need 3 Cars on Tuesday

Ramesh – I need three cars for Thursday's demonstration in Delhi. They need to be petrol engine cars, and they need to be packed for shipping by Tuesday night.

Here the subject line summarises effectively the most important details of the message. If the message is in response to another e-mail, our e-mail software will probably preface the subject line with Re: or RE: If our e-mail composition software does not do this, it would be proper to put in RE: by hand.

Subject : Re : Need 3 cars by Tuesday

Abdul – I have got two cars already packed from last week's demo, but I do not have another functional petrol engine right now. Can you manage with two-petrol engine and one diesel engine car?

For time-critical messages, starting with URGENT is a good idea (especially if we know the person gets a lot of e-mails):

Subject : URGENT : Need petrol engine cars

I need to have another petrol engine car for the Mumbai demo, by tomorrow afternoon. Ramesh only has two, and I have to have three. Therefore, if anyone could help in this regard I would really appreciate it!

For requests, starting with REQ : can signal that action is needed:

Subject : REQ : Petrol cars required

Abdul's call for a petrol engine car. Please check in your garage. You have seven of them with you that you are no longer using. Please take a moment to look around your area for petrol engine cars that you are no longer using, and get them back to Ramesh.

If we are offering non-urgent information that requires no response from the other person, prefacing the subject line with FYI: (For Your Information) is not a bad idea, as in

Subject : FYI : Sweets in break room

Arti has left some sweets downstairs in the break room. First come, first served!

8.3.2 Information

We should eliminate the word "information" from the subject lines (and may be from the body of the message as well) since it may be misleading to the reader. An example to explain the point:

Subject : information

Please send me information about Indian Institutes of Technology (IIT).

This gave the reader very little clue as to what the person wanted to know: admission, application or deadlines? The number of students? The number of buildings? Was the reader supposed to send paper documents or give URLs? The only thing one could do with an e-mail like this was ask for further context. Mail like this would have been much better as:

Subject : Indian Institutes of Technology Admissions Process (IIT)

Are there any web pages about admission process to IITs?

8.3.3 Quoting Documents

If we are referring to previous e-mail, we should explicitly quote that document to provide context. Instead of sending e-mail that says:

Did we get all the information that we required?

Say :

> *Did we get all the information that we required?*

The greater-than sign (>) is the most conventional way to quote someone else's e-mail words, but different e-mail software may use a different convention. Even if there are a fair number of words in our response, we still might need to quote the previous message.

Key Points

We may know what we are talking about, but our readers may not. Give them the proper context by:

- Giving useful subject lines
- Avoiding pronouns in the first few lines
- Quoting the previous message or document that has been used or referred to.

Use simple and clear words that directly indicate the purpose instead of ambiguous phrases that have the chance of being understood differently.

8.3.4 Identification

When one gets an e-mail from strangers, more care should be taken about what connection they have with the reader than how the reader is addressed in the mail. For instance when we send an e-mail to someone who does not know us, it would be good if we would immediately answer these questions:

- How did we learn about our correspondent?
- What do we want from our correspondent?
- Who are we?
- Why should our correspondent pay attention to us? (If we cannot answer this question, we should wonder if we should even send the e-mail).

Putting some of that information in a signature is better than nowhere at all, but putting it at the top is better for several reasons:

- Our identity is an important clue to the context of the message.
- If there is a problem with the transmission of the e-mail, the end is much more likely to get lost than the beginning.
- Many people get more than twenty messages per day, and so read them quickly. If we do not quickly establish our identity, our correspondent may delete our message before they find the underlying cause of the mail.

Good answers to the questions can take several forms:

Dear Ms Suman, I am an editor at Very Large Publishing Company, Inc. I sat next to your brother on Air India last week, and he mentioned that you are interested in publishing a book

based on your e-mail guide. I have read your guide, and would be very much interested in receiving a proposal from you.

Alternatively:

My name is Vijay and I am the legal counsel for Suraksha Security Services. We are deeply disturbed at the allegations that you cast upon us in your e-mail guide. Therefore, we order you to immediately cease and desist using any reference to Suraksha Security Services in your e-mail guide. If you do not, we will be forced to file suit against you or your descendants.

Another form of e-mail could be:

Hi - I am a novice e-mail user and just read your e-mail guide.

I don't know if you are the right person to ask or not, but do you know what the French word for "Mister" is If you can tell me the answer, I will send you a funny postcard.

Signatures

Many e-mail programs allow setting up a default signature to be included at the end of every message. Many people use these signatures as an easy way to give their name and alternate ways of reaching them. For example:

Hi - when do you want to go for lunch?

Suresh Gupta,

Managing Director,

Suraksha Security Services,

Wilson Street,

Delhi – 110001

Telephones: +91 11 –12346578/79

Fax: +91 11- 12345689

E-mail: suresh.g@suraksha.sec.com

Website: www.surakshasecurities.com

Such an extensive amount of signature information in contrast to such a short question looks unwanted. If they got the e-mail from you, they can reply by e-mail. So they do not need our FAX number or street address. (If they have to send a FAX or package, they can ask for address information.) They already have one e-mail address in the message we sent, and don't need our other e-mail addresses.

The name is perfectly reasonable to include, especially if

- Our e-mail messages do not include our full name in the From: line. (Send yourself an e-mail to see if our name is there or not.)
- The name in the From: line doesn't match the name we actually use
- The e-mail account is shared by multiple users (two persons having a joint e-mail account, for example).

The telephone number is also a reasonable thing to include - if we are willing to be interrupted by phone calls. Emotions are easier to convey over the phone, and some people prefer phone to e-mail for all circumstances.

If the message is business related, including the company name is a reasonable thing to do - even if the message is going to someone else in the same company.

One thing that is important from Vijay Gupta's signature above is that one would like to see is his job title. Is he the vice-president of sales or the shipping clerk? That may have more of an influence on the correspondent than anything else may. That signature is still overkill for arranging lunch, but it is not always convenient to switch between having our signature included or not.

Some people put things purely for entertainment in their signature: artwork, philosophical sayings, jokes, and/or quotations in their signature. This may be all sight, but do not overdo it.

After setting up a signature that is included automatically, it is easy to forget about it. Therefore, whenever a piece of contact information changes, make sure to revisit the signature to make sure that it is still up-to-date. In addition, if there is an entertainment piece in signature, change it occasionally. It will not be as funny the fiftieth time our coworker saw it as it will be the first time.

One final note on signatures : there is a good way to let our correspondent know that the entire message was transmitted properly. There is no body language to signal that we are "done talking" and, unfortunately, e-mail transmissions are sometimes interrupted.

Separators

Many people put pretty separators – lines, horizontal bars, and so on – around their signatures. For example:

Vijay Gupta –––––| Company Secretary, Suraksha Security Services.

+91 11- *12346578/79* voice | +91 11 *123465789*-fax

These are very pretty for normal (sighted) person, but imagine what it would be like for people who are visually challenged and that they have their computer read their e-mail to them: "hyphen hyphen hyphen hyphen hyphen hyphen..."

That said, some e-mail programs recognise "—" as a signature separator, and so can process the signature differently. Technically, the signature is supposed to be two hyphens plus a space, but it is very common to see just two hyphens without the space.

While sending e-mails to familiar people, some people often avoid the signature mentioned above, and simply end with words like *Regards* followed by their name.

Key Points

If we are well known to our correspondent, we can probably get away without including extra identification. In other cases, we should provide our correspondent with enough clues to figure out who we are, why we are writing, and why he or she should pay attention to us. Preferably, this information will be at the top of the message.

Greetings are difficult to do well, especially if we are crossing cultures and/or languages.

8.3.5 Auto Message Responder

Many times, it is seen that there is an unprecedented delay in responding to the mail due to travelling or non-availability. It is essential to activate our auto e-mail responder option, while we are away and we cannot check our inbox. This will inform the e-mail sender about our availability status and he/she can then act accordingly, instead of impatiently waiting for a reply from our end and suffering. An example could explain it more clearly:

To:

From : Self

Subject : Away for an assignment to Manali

Dear All,

I will be away on an assignment to Manali for five days and would be unable to access my mailbox. I would respond to your mail when I get back. In case of an urgency, please get in touch with Mr. Sameer Singh at sameer.s@suraksha.sec.com

Regards

Vijay

This will help the sender in making his/her decisions accordingly.

Some thumb rules for writing an effective e-mail *(net etiquette):*

1. Think before writing.
2. Keep the message concise.
3. Remember that e-mail is not necessarily confidential. Some companies retain the right to monitor employees' messages.
4. Do not attempt to "discipline" the reader. It is unprofessional to lose control in person – to do so in writing usually just makes the situation worse.
5. Do not "spam". Do not send unnecessary or frivolous messages. Soon, people will quit opening any message from you.
6. Do not type in all caps! It looks like we are yelling at the reader!
7. Do not type in all lower cases. If we violate the rules of English grammar and usage, we make it difficult for the reader to read.
8. Use indicative "Subject" line to get the readers' attention. e.g." Information on XYZ Project," or "Status Report Q1"
9. Take the time to proof read the document before sending it.

8.3.6 E-mail Attachment Size

E-mails are used for a host of purposes, for exchanging information in the form of images and other multimedia files. Due to this, many times senders attach heavy files in the form of photographs or MP3s that clog the inbox of the receiver. As an effective e-mail user, one should always see and assess the size of attachments that should be sent along with the mails. In unavoidable circumstances, it is best to confirm with the receiver before we send a heavy attachment.

8.4 TIMELINES AND CULTURAL DIVERSITY

E-mails are now one of the fastest media of communication globally. In this section, we will try to understand the importance of co-existence of various cultures and time-lines within which we function. For instance, in some cultures it is appropriate to be to the point in a conversation; while in others we may be required to include the greetings and salutations and the background before we actually come to the main point of conversation.

An effective e-mail communicator always keeps in mind the comfort of the receiver of the e-mail. Keeping the timelines in mind is not necessary while writing an e-mail but one should keep timelines in mind while making a phone call. For instance, it would be inappropriate to call someone in US while it is morning in India, since it will be late night in the US.

8.5 GREETINGS AND SALUTATIONS

Interestingly, even in the Indian context, we find cultural diversity. There are different ways in which people greet and acknowledge each

other. So an effective communication would include careful usage of greetings and salutations even if we are sending some documents or information from north to south or from, east to west of our own country. A careful selection of openers and closers of a document makes the whole document more interesting and effective at the same time.

Every new medium develops its own protocols or rules for opening and closing. Telephone conversations start with "Hello" and end with "Goodbye". Letters open with "Dear" and end with "Sincerely". However, even though e-mail is so often used for communication, there is no firm custom on how to open and close the same. Many people do not give either a salutation or a signature. After all, while a letter can be separated from its envelope easily, it is difficult to separate the body of an e-mail message from its addressing information. The e-mail message itself says who it is for and from whom.

In this chapter, we will learn some of the commonly practiced thoughts on openers and closers, but we need to think carefully about what we are trying to convey both explicitly and implicitly. We also need to take the culture and customs of all parties into consideration.

Salutations are tricky, especially if we are crossing cultures. Frequently, titles are different for men and women, and we may not be able to decide how to address. The family name is first in some cultures and last in others. Honorific may vary based on status or age. So do not feel bad if we have trouble figuring out which salutation to use: it is a difficult problem.

In some countries, it is a bad idea to use "Sir" or "Mr." unless we are certain that our correspondent is male. While in some others, a 'Dear Sir' is an accepted salutation. Similarly, it is probably safer to use "Ms" instead of "Miss" or "Mrs." unless we know the preference of the woman in question.

In non-formal e-mail transaction, we often use "Hi" or "Dear" to address the recipient along with their first name.

Given that e-mail is relatively informal, frequently there is no problem in dispensing with names and titles altogether, especially if we are in a position of higher status than our correspondent:

> *Hello - I saw your website and wanted to mention that*
>
> *I invented the fountain pen on Apr 29, 1803, *not* on Apr 28, 1802.*

Many people use a simple "Hi" for those they already know:

> *Hi - Are you going to school next week? I can bring all my project reports there..... .*

"Good Morning" and "Good Afternoon" do not make a lot of sense with e-mail, as the sun may have moved significantly by the time our correspondent gets around to it.

8.6 REMOVING BARRIERS AT ALL THESE STAGES

To deliver our messages effectively, we must commit to breaking down the barriers that exist in each stage of the communication process. Let us begin with the message itself. If our message is too lengthy, disorganised, or contains errors, we can expect the message to be misunderstood and misinterpreted.

Barriers in context tend to stem from senders offering too much information too fast. It is best to be mindful of the demands on other people's time, especially in today's ultra-busy society. Once we understand this, we need to work to understand our audience's culture, making sure we can converse and deliver our message to people of different backgrounds and cultures within our own organisation, in our country and even abroad.

8.7 WRITING SKILLS

Many people are intimidated by writing. Even so, there are times when writing is the best way to communicate, and often the only way to get our message across. While writing, remember that once something is sent in written form, it cannot be taken back. This presents written communicators with additional challenges, including spelling, grammar, punctuation, even writing style and actual wording.

Thankfully, today's technology makes memo, letter and proposal writing much easier by providing reliable tools like word processors that check and even correct misspellt words and incorrect grammar.

8.7.1 The Importance of "Etiquette"

Some of the most basic tips to remember when writing include:

- Avoid slang words
- Try not to use abbreviations (unless appropriately defined or widely accepted)
- Steer away from symbols (such as ampersands [&])
- Clichés should be avoided, or at the very least, used with caution
- Brackets are used to play down words or phrases
- Dashes are generally used for emphasis
- Care should ALWAYS be taken to spell the names of people and companies correctly
- Numbers should be expressed in words when the number is less than 10 or is used to start a sentence (example : Ten years ago, my brother and I...). The number 10, or anything greater than 10, should be expressed as a figure (example : My brother has 13 matchbox cars.)

- Quotation marks should be placed around any directly quoted speech or text and around titles of publications
- Keep sentences short.

While these tips cover the most common mistakes made when writing letters, memos and reports, they in no way cover everything we need to know or ensure that our written communications are accurate and understood.

Netiquette primarily involves any communication we may send out or receive from the Net.

8.7.2 Letter Writing Skills

When writing letters, it is best to address the letter to an individual. Moreover, when beginning the letter with a personal name, be sure to end it with an appropriate closing, such as 'yours sincerely'. If we cannot obtain an individual's name, consider ending it with a more generic (less personal) closing, such as 'yours faithfully'.

Normal business letters should start with an overall summary, showing in the first paragraph why the letter is relevant to the reader. It is not a good practice to make the reader go past the first paragraph to find out why the letter was sent to them.

The body of the letter needs to explain the reason for the correspondence, including any relevant background and current information. Make sure the information flows logically, ensuring that we are making our points effectively. The closing of the letter is the final impression we leave with the reader. End with an action point, such as 'I will call later this week to discuss this further'.

8.8 THE IMPORTANCE OF CAREFUL PROOFING

Perhaps the most important thing to remember when writing a letter is to check it thoroughly after it is completed. This "unwritten" rule holds true for everything we write – memos, letters, proposals, etc.

We should use both the grammar and spell check on our computer, paying close attention to every word highlighted. We should not place total faith on our computer. Instead, we should have both a dictionary and thesaurus (printed or online) handy to double-check everything our computer's editing tools highlight, as these tools are certainly not always reliable in a given context.

Is our written communication well organised? Does each idea proceed logically to the next? Would some additional headings help? We should make sure our written communications are easy to read and contain the necessary information, using facts where needed and avoiding information that is not relevant. We should also, outline the course of action we expect, such as a return call or visit.

Finally, we should close appropriately, making sure to include our contact information. While this may seem obvious, it is sometimes overlooked and can make our written communications look amateurish. This can diminish our chances of meeting our written communication's goals.

8.9 AUDIOVISUAL COMMUNICATION SKILLS

Computer and Communication Technology have empowered us to digitise our audio and video inputs and communicate across long and far-reaching destinations. In most of the audio communications, many users do not keep in mind certain essential aspects of audio communication and this results in either miscommunication or no communication. Similarly, in using a tool for video communication some things should be kept in mind so that the communication is effective and there is minimal loss of information intended to be conveyed.

Audio Communication Skills

- Always have a sufficient knowledge of the issue that we are dealing with in the audio communication and the key points that we have to discuss. (always remember that the person on the other side can only hear us and respond to our details).
- Do not use very long sentences, since it is difficult to grasp if the sentences are too long.
- Always have a modulated pitch of voice, we should stress and emphasise on the words that we want to convey more strongly than the rest of our communication.
- Make use of key words and terms that are related to the issue in consideration, this will minimise the understanding time of the receiver of the information.
- Never speak in a jet speed fashion; always speak clearly voicing out each word and do not leave it for the receiver to understand it on its own.
- Always give sufficient time to listen to what the person on the other side is saying. Allow the other person also to speak his/her part and then respond to him/her after s/he has finished.
- Always have a note-book and pen/pencil marker to note some information given immediately by the receiver
- If we are on multi-people conference call then we should first introduce ourselves and then deliver the message.
- Use of correct salutation is also important depending upon the regional/global context of the person/s we are communicating with.
- Summarise the discussion at the end of the meeting.

Video Communication Skills

- In a video communication to one or many person(s), one should always keep in mind that audio is integrated with video. Hence most points mentioned above are relevant.
- Dressing up for the occasion is also a part of the communication, since many times video conferences are formal in nature.

- There should be enough preparation for the occasion so that while communicating, we should not be looking for any information that is sought by person(s) on the other end.
- Greeting every one and introducing our selves is essential in video communication especially when there is more than one person on board.
- Always give an opportunity to others to express themselves in the communication and allow participation of all.

8.10 ACTIVE LISTENING

Hear What People Are Really Saying

It is obvious that if we have poor interpersonal communications skills (which include active listening), our productivity will suffer. This is simply because we do not have the tools needed to influence, persuade and negotiate – all necessary for workplace success. Lines of communications must be open between people who rely on one another to get work done.

Considering this, we must be able to listen attentively if we are to perform up to expectations, avoid conflicts and misunderstandings, and to succeed. Following are a few short tips to help us enhance our communication skills and to ensure that we are an active listeners.

8.10.1 Start by Understanding Our Own Communication Style

Good communication skills require a high level of self-awareness. Understanding our personal style of communicating will go a long way towards helping us create good and lasting impression on others. By becoming more aware of how others perceive us, we can adapt more readily to their styles of communicating. This does not mean we have to be a chameleon, changing with every personality we meet. Instead, we can make another person more comfortable with us by selecting and emphasising certain behaviours that fit within our personality and resonate with another. In doing this, we will prepare ourselves to become active listeners.

8.10.2 Be an Active Listener

People speak at 100 to 175 words per minute but they can listen intelligently to up to 300 words per minute. Since only a part of our mind is paying attention, it is easy to go into mind drift - thinking about other things while listening to someone. The cure for this is active listening - which involves listening with a purpose. It may be to gain information, obtain directions, understand others, solve problems, share interest, see how another person feels, show support, etc. If we are finding it particularly difficult to concentrate on what someone is saying, we should try to repeat their words mentally as they say it - this will reinforce their message and help us control mind drift.

8.10.3 Use Nonverbal Communication

Use nonverbal behaviours to raise the channel of interpersonal communication. Nonverbal communication is facial expressions like smiles, gestures, eye contact, and even our posture. This shows our interest to the person we are communicating with. This will prompt further communication while keeping costly, time-consuming misunderstandings at a minimum.

8.10.4 Give Feedback

Remember that what someone says and what we hear can be amazingly different! Our personal filters, assumptions, judgments, and beliefs can distort what we hear. Repeat or summarise to ensure that we understand. Restate what we think we heard and ask, "Have I understood you correctly?" If we find ourself responding emotionally to what someone said, say so, and ask for more information: "I may not understand you correctly, and I find myself taking what you said personally".

8.11 CHUNKING

Grouping information so it is more easily understood

Effective communication is possible when the sender and receiver are able to exchange desirable information with each other at a timely rate. Therefore, where the relevant information is and how is it stored forms a significant component of effective soft-skills in communication. Think about the amount of information we have to process each day. We read reports and meeting notes, we discuss problems, we hold team briefings, and we chat by the water cooler. Some of the information we receive is easy to understand and retain; some of it is not. The difference is often in how the information is presented.

Imagine we are playing the memory game "what's missing!" In this game, we simply have to memorise all items that are presented to us on a tray – then work out which one has been removed. If the items on the tray are presented in a jumble, will we be able to figure out what is missing? Instead, if the items are organised according to size, colour or shape, it will be so much easier to spot what is missing this time!

When the items are categorised, the "information" on the tray is much easier to make sense of and retain the same. We can skim the tray and grasp exactly what is being presented. This process of grouping information so that the intended audience easily understands it is known as "chunking".

Evidence that chunking works is all around us:

- Phone numbers and credit card numbers are typically chunked. Both types of numbers are usually chunked in groups of three or four numbers.

- When we encounter a phone number that is chunked differently than the way we are used to, it can be much harder to remember it.
- Rather than memorising the letters O – T – M – E – E – R, clubbing them to the word "REMOTE" makes the task much easier.

When written or verbal information is chunked effectively, it is logical, organised, and consistent. This enhances the audience's ability to understand what is going on. A written format that is chunked gives readers quick access to the big picture. From there they can get into the details as needed. And a verbal format that is well structured and logically chunked helps listener follow and remember key ideas or details as necessary.

An example of how the mind processing happens:

fi yuo can raed tihs, yuo hvae a sgtrane mnid too Cna yuo raed tihs? Olny 55 plepoe out of 100 can. i cdnuolt blveiee taht I cluod aulaclty uesdnatnrd waht I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in waht oerdr the ltteres in a wrod are, the olny iproamtnt tihng is taht the frsit and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and wecan sitll raed it whotuit a pboerlm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Azanmig huh? yaeh and I awlyas tghuhot slpeling was ipmorantt.

Summary

- Soft skills are personal attributes that enhance an individual's interactions, job performance and career prospects.
- Soft skills not only include personal skills but also include interpersonal skills.
- Communication is the process of transferring information from a sender to a receiver with the use of a medium.
- E-mail is one of the most popular communication methods.
- While using e-mails we should be careful about the subject line, content and identification.
- While writing e-mails we should keep in mind the cultural diversity.
- Active listening is a way of listening and responding to another person in a way that improves mutual understanding.

EXERCISES

Short Answer Type Questions

1. Name some of the stages of communication in which errors may crop in.
2. What is the importance of feedback in communication?
3. List some factors responsible for misinterpretation of messages by the receiver.
4. What is meant by context in relation to communication?
5. What is the use of subject line in e-mails?
6. Why should one be careful about cultural diversity while writing salutation in an e-mail?
7. What is meant by signature in an e-mail?
8. What is auto message responder?
9. What is an e-mail attachment?
10. Why is proofing important?

Long Answer Type Questions

1. What is the need for effective communication? Elucidate some of the key aspects by having a group discussion with our fellow classmates.
2. Do we agree that if one has best knowledge of computer tools and techniques he/she will be a good communicator also? Support our answer with examples from your experience.
3. What are the various cultural diversities we should be sensitive towards in our communication with others? Support your answers with examples from the Indian context or global context.
4. What are the key things that we should keep in mind while sending an e-mail to a person who requires attachments of multi-media contents.
5. Discuss some etiquette that one should follow while writing.
6. What are the key points that one should remember while video-conferencing?
7. Discuss the importance of listening.
8. With a suitable example, elucidate the meaning of Chunking?

Activities

1. Form two groups with the names "Sender" and "Receiver" and bring out the main points of effective computer communication technology.
2. Within a group of not more than eight members share examples of "effective e-mail" and "ineffective e-mail" in your class.
3. If we are making a video-call to a person in Washington, what are the key things that we should keep in mind? Have a discussion within your peer group to establish the importance of time-lines and cultural diversity in communication.