Communication: Introduction

Communication is a marvelous and outstanding tool as far as human interaction is concerned. It makes our life livable, as man is a social animal and he or she can not live in isolation. However, The communication process is quite complex. Its complexity is dependent on the variety of ways in which it can be defined.

Communication is any behaviour, verbal, nonverbal or graphic that is perceived by another. It consists a web of activities that differ in different situations. In the workplace you would probably communicate, when talking formally to customers as compared to informally with a peer. How you understand different situation will ultimately analyse your communication behavior.

Communication is the most common feature of our life. Human beings can not survive in isolation. We cannot imagine our life without it. Every living species have their own way of communication. We use different symbols, gestures, and other different means to communicate with each other. Communication is required not only to represent our ideas, views, Feeling but also to understand other people. Classroom communication is very crucial in teaching. It requires the attention from both sides i.e.. From the teacher as well as from the student. As, if a teacher explains a topic in a language which is not known to the students, his teaching will be unusable. He has to communicate in a way which is most acceptable to the students.

Communication may be defined as “an exchange of ideas, facts, opinion or emotions by two or more people” An crucial virtue to be developed by teacher is the promotion of competent communication skill. The teacher should be able to communicate in an effective manner by arranging the information emphatically and logically. It should enable children to understand and conceptualized their world. This is the very essence of communication in teaching. The word “Communication” is basically derived from the Latin word “Communicare” which means “to make common.” or “to share” It is also believed to have been based on a Latin word, “communis” which means to communicate and share, to impart a piece of information, a message, an idea or concept. It is a process, which includes transmission of information, ideas, emotions, skills, knowledge by using symbols, words, pictures, graphs, drawings, illustrations etc. The act of communication is known as ‘transmission’

“Communication” is the process by which we understand and in turn try to be understood by others. It is dynamic, frequently changing and shifting in response to the entire situation. “communication” can be defined as “the interchange of thoughts or ideas” The objective of communication is to induce, inform, suggest, warn, order, change behaviour and establish better relation with others.

Effective communication is a prerequisite for the attainment of objectives, more so in educational institutions. All teaching-learning process is carried through the process of communication. Generally, it seems that communication is a one way process. But we can see in our daily life that it is a two way process, as, communication is a system through which the messages are sent, and feedback are received.
Communication is, therefore, the process of transferring a specific information or message from an information source to a desired, definite or a specific destination.
1. *One of the fundamentals of communication messages is perception. The effectiveness of communication is limited by the recipient's range of perception.*
2. *Secondly, people perceive only what they understand.*

3. *Thirdly, communication makes a demand on the recipient pertaining to the emotional preference or rejection.*
4. *At last, communication is not to be focused with information. As information is logical, formal and impersonal but communication is perception. Communication process is generally happens through spoken or written words, pictures and in many other equivalent forms.*

In oral communication, the transmitter is the "voice box" of the speaker. In telegraphy, it is the telegraphic key board or Morse key which codes the message into dashes and dots.

The receiver decodes the transmitted message in a form he can understand and comprehend. The receiver of the message may be the human ear, which converts sound waves into a comprehensible form which can be recognized by the human brain; a television receiver decodes the electromagnetic waves into recognizable visual representation. The printed message can be deciphered by a receiver which can recognize and understand the language.

Noted communication scholar, *David K. Berlo*, has stated that *"we look to the message like speech, manuscript, play, advertisement, etc. To determine the communicative purpose"* The process of communication involves a procedure consisting of only a few steps.
Berlo has suggested one model to properly comprehend the process which includes: A communication source or an encoder, A message, A channel, A decoder or a communication receiver or a destination. This is reflected as follows: The information source, decides to communicate and encodes a message, transmits it through a channel to the receiver, which is then decoded and acted upon. There are noises or distortions in the process.

Features Of Communication

Communication can be explained as a systemic process, Where people interact with the help of symbols to integrate and interpret meanings. In the definition of communication three crucial points has been covered.
Process: Communication is a process, which means that it is ongoing and always in motion. It's difficult to quote when a communication process starts and when it stops because what happened before we talk with someone may influence our interaction and what happened in a specific interaction may affect the future, communication process is always in motion, moving forward and changing frequently. We cannot stop communicating at any point of time, Hence it is a continuous process. It is not stagnant in nature so it is a dynamic process.

Systemic: Communication occurs within a definite system. A system comprises of various inter-related components that influence one another. If we consider a classroom communication, teacher and each student is part of the system. Also, the physical environment and the time of day are elements of the system that affect interaction. The history of a system also influences communication. If a student has a history of listening sensitively and working out problems then he or she will be in a better mode of communication.

On the other side, if a student has a record of conflicts and internal disputes, Then he or she might face problems while communicating in a classroom. Communication is also influenced by the larger systems within which it occurs. Symbolic communication is done through symbols. It depends on symbols, which are abstract, arbitrary, arid ambiguous representations of information. Always keep

in mind that human communication consists of interaction with words spoken or written and through symbols.

Meanings: At last, The definition throws right on meanings, which acts as the heart of the entire communication process. Meanings are the significance and focuses on the phenomenon. We can not consider meanings in experience only, Rather we use symbols to form meanings.

Forms and Types of Communication

People integrate or communicate with one another in various different ways that relies on the message that they want to send and the context in which it is to be sent. There are a variety of forms and types of communication namely e-mail, face-to-face, telephone, meetings, corridor conversations and seminars. Dwyer divided these into the following-

1. Three forms of communication-verbal, nonverbal and graphic.
2. Four forms of communication-intrapersonal, interpersonal, public and mass.

Communication Models and Theories

Communication is a changing as well as interactive process, Hence it is not stagnant in nature. There are various definitions of communication, so there are many models of communication, each give us different view-point of how people deliver and interpret message. Like a jigsaw puzzle, each model gives a component of the picture, but no model covers all its aspects.

A. Berlo's Model

Berlo's focus was on the transmission model of communication. He also introduced more human elements, such as the relationship between the message channel and the vital five senses.

Effective communication consists both the sender and the receiver. The sender must be as clear as possible and the receiver must signal understanding or clarification. It consists both content and relationship elements-

1. Content = message, idea.
2. Relationship = emotions, power, status.
3. Personal Encoding or decoding are dependent on a person's perception and views towards the world.

B. The Transmission Model

The transmission model focuses on delivering the meaning or message from the sender to the receiver. Communication process is one way.

C. The Process Model

The transmission model was adapted to form the process models in which people transmit, receive, interpret and respond to messages with feedback.

The process models comprised of seven core elements which are quoted below:

1. Sender
2. Message
3. Receiver
4. Feedback
5. Channel
6. Context or setting (i.e.. Environment)
7. Noise or interference

As far as the process models are concerned, a message is initiated and then encoded by the sender and he follows a particular communication channel like voice or body language and then decoded by the receiver. The receiver then gives feedback, Which is generally a revert or reply. However, noise or any kind of undesirable interference have an influence on the communication process.

Hindrances to Communication

The hindrances in a communication process also takes place if the sender and receiver are not on the same “wavelength” It is consider when we talk about human communication as it is in radio transmission. In the terms of ‘jargon’ of communication, all hindrances whatever their nature are combined in a general label known as ‘noise’ it not only consists atmospheric or channel disturbance, but also cover all those hindrances that somehow degrade the essense of a communication process.

1. Physical hindrances: There are majorily four core types of hindrances which are called as ‘physical hindrances’ in the communication process. These are stated below:

a. The Competing Stimulus in the type of another conversation going on within hearing distance or loud music or traffic noise in the background.

b. Environmental Stress: It consists high temperature and humidity, poor ventilation, vibrations felt, a strong glare, there all have the capacity to create distortions while sending and receiving messages or information.

c. Subjective Stress: It consists Sleeplessness, ill health, the effects of drugs and mood fluctuations may give birth to around subjective 35 stress that in turn cause major difficulties in listening and interpretation.

d. Ignorance of the Medium: The various different media used for the communication are: Oral, written, audio, visual and audio-visual. The use of a medium with which the receiver is not aware, In such case the medium become a hindrance.

e. Psychological hindrances: Every person has certain ‘frame of reference’ it acts as a window with the help of which we look out at the world, at people and events and situations. A frame of reference is a systeM'which deals with standards and values, generally implicit, underlying and to some extent controlling aI! action, or the expression of arty belief, attitude or idea. No two individuals possess exactly similar frames of reference, even if they are identical twins. Upto a great extent our experiences, specially our childhood experiences and the cultural environment in which we have grown up, all have certain impacts on our frames of reference.

f. Linguistics and Cultural hindrances: With the help of language we express our thoughts and experiences to other people in terms of their cultural environment. When the same language is made use of in a different culture, it takes an another colour, another meaning. Mechanical hindrances: Mechanical hindrances are those raised by the channels employed for interpersonal, group or mass communication. Channels become hindrance when the message is interfered with by some disturbance, which accelerates difficulty in reception or prevented some elements of the message reaching its destination or both.

g. In case of lack of such communication facilities would cause mechanical hindrance. Such type of hindrance consists any disturbance, which interferes with the fidelity of the physical transmission of the written, intentional-unintentional and so on. One of the most general typology relates 0 the size of the social group or the number of people who shares the experience of communication. Such a typology ranges from the intrapersonal. Interpersonal and transpersonal to the group.

Communication Barriers

Ineffective communication may cause errors, misunderstanding, poor performance, lower motivation and morale, negative atmosphere in the environment of the workplace and various other matters, that may detract from achieving organisational goals. It is very crucial to minimise and lower down the barriers to achieve effective communication: Communication barriers degrade or interrupt the message as well as the meaning.

Organizational Communication

Organizational communication is majorily done to influence, inform, control or inspire. Organisational communication is categorised into two broad systems of communication-formal or structured i.e.. Within the ‘systems’ established by management and another one is informal i.e.. When co-workers discuss regarding the company matters. Both the areas are very remarkable and both must be ‘healthy’ to ensure a healthy growth of an organisation.

Formal Communication Channels and Networks

Formal communication channels follow the organisational structure or hierarchy and flow in four directions:

The four forms of directions in which communication can travel are as follows: Downward; upward; lateral or horizontal and diagonal.

1. Downward communication is a form of communication which flows from the higher levels of management to the lower levels, In this basically company's goals, strategies or role expectations are communicated by the managers.

2. Upward communication is a form of communication which flows from the lower levels of management to the higher levels in the organisation, for example generally it comprises communication regarding grievances, problems, results, suggestions or feedback.

3. Horizontal communication is a form of communication which flows across the same level in an organisation, for example integration of activities with peers (teams, committees), dissemination of vital information from one department to another. It comprises sales forecasts from the sales department to production and problems such as a problem with product design from the production department to research and development. Horizontal communication provides a great ease in the interaction process in various areas of expertise and also induce innovation.

4. Diagonal channels have the potential to create disputes as they comprise communication between the lower level of one department to a higher level in another. In the diagram above, this may cause friction between the employee in accounting department C and the Vice-President (VP) of Accounting as the employee has gone around his or her own superior. This form of communication may be useful as it simplify the desirable information and reaches to the Marketing Department and the VP Accounting does not need to be engaged in the whole process.

Formal communication is a communication which takes place within the hierarchy of the organisation and shows how groups of employees, for example those in a department, work together. Networking or mapping the flow of communication in an organisation can be a helpful device. Basically, fomal structure follows scalar chain. It can become easy to identify who is communicating with whom and whether the lines of communication are effective or whether there is a destructive conflict or tension arising from the communication channels, for example inappropriate diagonal communication.

Formal Communication: Problems and Solutions

Various communication problems arise because of the organisational framework. Dwyer stated three related organisational factors: Centralisation; the creation of too many organisational layers; and the structure of the organisation. Other factors may comprise downsizing which leads to ambiguous reporting structure and poor leadership. Many of these problems may be overcome by: Analysing the organisation structure and communication networks for barriers to effectiveness and efficiency ensuring downsizing is well planned and the 'survivors' i.e.. Those left in the organisation know the influence of the process on communication networks and procedures recruiting for competent communication, specially when recruiting for leadership roles.

Informal Communication

Informal communication is a part of an organisation and its inevitable, It exists outside the formal horizons of the organisational framework. A very common example is friendship groups. The informal communication fulfills majorily two core objectives: It allows employees to satisfy their desire for social interaction in the workplace and it can enhance an organisation's task and work by creating alternative and a faster and more effective, channels of communication (Robbins et al. 2000).

Grapewine communication is one of the very common form of informal communication, Kreitner and Kinicki in the year 1995 defined the term grapevine is originated from the American Civil War practice of stringing battlefield telegraph lines between trees as a means of effective communication. Now a days in an organisation it complements the formal communication.

Communication Elements

1. The sender initiate the communication process with having an idea in his or her mind and begins the communication process by forming intentions and feelings that need be transferred. The sender is required to filter out the details that are uilcrucial and focus his or her energy on the most desirable information. The source or encoder makes the decision to integrate. The source also determines what the purpose of the message will be to inform, persuade or entertain. The communication process starts from the source. First, the source must encode or form a message. The information that the source wants to send must be put into a form that can be sent to the receiver.

2. Message: The second most crucial element of the communication process is the message or the overall information which is being communicated. The source encodes an idea and then determines whether or not to inform, persuade, or entertain. After deciding what message to send, the source uses symbols to get the message across to others. These symbols stand for other things. The most crucial symbols are words, which can represent objects, ideas, and feelings. These words permit us to share our thoughts with other members of our species. To increase the likelihood of successful communication, the source must try to encode in a way that the receiver understands, so that the receiver can properly decode or interpret the message.

3. Channel: Channels are the means namely pathways or devices by which messages are communicated. Channels may be described and analyzed in two different ways. The first involves the form in which messages are sent to receivers. Forms comprise both verbal and nonverbal channels of communication. We use our five senses to receive messages from others. Channels can be defined as the manner of presentation employed in communication. Depending on the situation, the source would focus on verbal and non verbal channels of communication. If the speaker is not in

front of the audience his or her physical appearance wouldn't matter, but if he or she is giving lectures in a classroom or before a live audience, personal appearance could easily influence the reception of the message. Whatever channels of communication are used, the source must learn to adapt the message to make use of the most appropriate channels available for the situation.

4. Receiver or Decoder: The person who receive the message is known as the receiver. The act of interpreting messages is known as decoding. Receivers decode messages based on past experiences, perceptions, thoughts, and feelings. We first have a physiological reception of stimuli i.e.. a noise causes sound waves to hit our eardrum or a movement catches our eye. We must focus on both the verbal and non-verbal stimuli and reduce all the stimuli bombarding us to one or two we can cope with more easily. We must try to understand the stimuli and interpret them into messages i.e.. We decide that the noise is a telephone bell or that the movement is a friend waving to us around campus. At last, we store this information for later use so that next time we will be able to respond to the stimuli often more quickly. It is crucial to keep in mind that receivers make quick decisions about what they will respond to in a particular situation.

5. Feedback: Feedback is also known as a reply or a revert is the most vital element of the entire communication process. Each party in an interaction continuously sends messages back to the other. This return process is known as feedback. Feedback shows the source how the receiver has interpreted each message: The feedback, which delivers lack of understanding is known as negative feedback. ‘Positive feedback, on the other hand, indicates that the receiver has understood the source's message. It not all the times mean that he or she agrees with the source, just that the message was interpreted accurately. Feedback can also be ambiguous, not clearly positive or negative.’ See “and” mm-hmm" can be examples of ambiguous feedback i.e.. Confusion. The effective communicator is always sensitive to feedback and frequently changes his or her messages as per the feedback received.

6. Hindrances or Noise: The human communication system can be compared with a radio or telephone circuit. Just as in radio transmissions, where distortion can occur at any point along the channel, there can be similar hindrances in human communication. The source's information may be unclear. Or the message can be ineffectively or inaccurately encoded. The wrong channel of communication may be used. The message may not be decoded the way it was encoded. At last, the receiver may not equipped to handle the decoded message in such a way as to produce the response or reply expected by the source. ‘hindrances’ are any obstacles or difficulties that come in the way of communication. They may be physical, mechanical, psychological, cultural or linguistic in nature. Also, then are the hindrances, raised by interpersonal relationships between individual and groups, the biasness of both individuals and groups and the channels they use to integrate or communicate.

We can ascertain the elements that are being engrossed (circulatory and digestive systems, for example), can judge how those elements'influence one another and can focus on the nature of entire process. Applying this approach to the communication process, we came to know ***eight vital elements***-

1. a source or encoder of communication, which initiate
2. a message
3. through a channel or a mode to
4. a receiver or decoder, which
5. replies with a feedback with

6. possibilities of communication Barrier in each stage of communication. These elements must be well understood and can scrutinize with
7. the situation or context
8. the system i.e.. Relationship, which is being formed and sustained at few levels by the communicator.

Communication and Technology: Communication Process

As mentioned above, we can clearly see that there are six elements of communication: a code, a channel, encoding, decoding, encoder and decoder.

A message is communicated or a piece of information is conveyed by means of a mechanism. This is necessary with a view to being able to convey the message/information fully and completely. Thus, there is a sender of the message who is also called an encoder, just as a computer understands the language of a code.

A channel or device is used to communicate the message. It could be a radio or a television set, newspaper or magazine and the like: The encoding process means putting the message together or arranging the ideas in a recognizable and understandable form, for conveying it to the receivers. Unlike in telegraphy, the encoder here is an human agent.
The encoder decides the content of the message.

Similarly, decoder is the destination where the message lands. The receiver has to wait for the words to be spoken or written and to make out what he/she can make of them according to his or her knowledge, experience, assumption, and attitudes. When two people communicate who are equally matched in intelligence, social backgrounds and comprehension power; the advantages and disadvantages pass from one to the other. Thus, the encoder (who is the initiator of the communication activity) chooses his subject and the channel of communication and makes the first impact on the mind of the decoder.

Decoding is one of the most crucial and very crucial elements of the communication process. The entire process of comprehension process of communication hinges on the decoder of course, the message will be received, recorded and interpreted differently by different people according to their knowledge, experience and understanding levels.

DELNET

DELNET was started at the India International Centre Library in January 1988 and was registered as a society in 1992. Earlier it was supported by the National Information System for Science and Technology (NISSAT), Department of Scientific and Industrial Reseach, Government of India. It was subsequently supported by the National Informatics Centre, Department of Information Technology, Ministry of Communications and Information Technology, Government of India and The Ministry of Culture, Government of India.

DELNET has been established with the supreme goal of promoting resource sharing among the libraries through a huge network of libraries. It aims to collect, store, and disseminate information

along with providing computerised services to its users, to integrate efforts for suitable collection and also to lower down the unwanted duplication, wherever required.

Main Objectives of DELNET

1. To enhance the interaction of resources among the libraries by cultivating a huge network of libraries, by collecting, storing and dis-seminating information and providing computerised services to the users.

2. To undertake scientific research in the field of Information Science and Technology, create and form new systems in the field, apply the results of research and publish them.

3. To provide technical knowledge and know-how to the member-libraries on assimilating, storing, sharing and dis-seminating information.

4. To integrate efforts for desirable collection and to lower down unwanted duplication, wherever required.

5. To establish referral, research centres and sustain a central online union catalogue of books, serials and non-book materials of all the participating libraries.

6. To facilitate and promote delivery of documents manually or mechanically.

7. To facilitate specific bibliographic database of books, serials and non-book materials.

8. To facilitate database of projects, specialists and institutions.

9. To promote and sustain electronic and mechanical equipments for quick communication of information and delivery of electronic mail.

10. To co-ordinate with the other regional, national and international networks and libraries for information and essential documents.

ERNET: Education and Research Network

Education and Research Network also known as ERNET, India is an independent scientific society of Ministry of Communication & information technology (Govt. Of India). ERNET has made a remarkable contribution in the development of networking in the country. It practically brought the Internet to India and has built up national capabilities in the area of net-working, specifically in protocol software engineering. It has not only attained success in cultivating a huge network that provides different facilities to the intellectual component of Indian society i.e.. The research and education community, it has also become a trendsetter in the area of networking over the years.

ERNET is the greatest terrestrial and satellite network with point of presence located at the premiere educational and research institutions in major cities of the country. Focus of ERNET is not limited to just providing connectivity, but to meet the entire needs of the educational and research institutions by hosting and providing relevant information to their users. Research, Development and Training are the vital parts of ERNET activities. The activities at ERNET India are conducted on five technology focus areas, which are quoted below:

ERNET was instituted in the year 1986 by the Department of Electronics (DoE) and avail the economical support from the Government of India and United Nations Development Program (UNDP), comprising eight premier institutions as participating agencies NCST (National Centre for Software Technology) Bombay, IISc (Indian Institute of Science) Bangalore, five IITs (Indian Institutes of Technology) at Delhi, Bombay, Kanpur, Kharagpur and Madras, and the DoE, New Delhi. ERNET began as a multi protocol network with both the TCP/IP and the OSI-IP protocol

stacks running over the leased-line portion of the backbone. From the year 1995 almost all traffic is carried over TCP/IP.
1. National Academic and Research Network.
2. Research and Development in the area of Data Communication and its use.
3. Human Resource Development in the area of High-end Networking.
4. Educational Content.
5. Campus-wide High Speed Local Area Network.

History of ERNET

1.ERNET started with Dial-up network in the year 1986 − 87.
In the beginning, UUCP mail was the only service started by ERNET.
2. First leased line of 9.6 kbit/s was installed in Jan'1 between Delhi and Mumbai.
3. ERNET was alloted Class B IP address 144.16. 0.0 by InterNIC in 1990. Subsequently Class C addresses were alloted to ERNET by APNIC.
4. All IITs, IISc Bangalore, DOE Delhi and NCST Mumbai were connected by 9.6 kbit/s leased line by 1992.
5. In 1992, 64 kbit/s Internet gateway link was commissioned from NCST Mumbai to UUNet in Virginia near Washington DC.
6. In 1998 ERNET India was registered as an independent Society.
7. In 1999 − 2000 new terrestrial high speed backbone was setup.
8. In 2000 POP infrastructure was developed.
9. Satellite WAN was formed in the year 1993.
10. Today, 1100 institutes are ERNET users under different schemes.
11. ERNET backbone ERNET backbone is a very crucial link of terrestrial and satellite-based wide area networks. The satellite WAN, using VSAT technology. The VSAT network become an overlay for the terrestrial WAN by providing backup links between the backbone sites. International connectivity is attained through gateways at New Delhi, Mumbai, Bangalore and Kolkata, with a total capacity of 6.64 Mb. Daily traffic over ERNET exceeds 20 GB. ERNET architecture is dependent on the industry standard TCP/IP protocol.
12. ERNET backbone is being discovered to support IPv6.

Information and Library Network (INFLIBNET)

Information and Library Network - INFLIBNET Centre is an Autonomous or independent Inter-University Centre (IUC) of University Grants Commission Government of India, Which focuses in promoting infrastructure for sharing of library, information resources and services among Academic as well as Research Institutions. INFLIBNET works jointly with the Indian university libraries to re-design the future of the academic libraries in the emerging information environment.

Introduction Information and Library Network (INFLIBNET)

The centre is an autonomous Inter-University Centre of the University Grants Commission (UGC) of India. It is a core National Programme started by the UGC in the year 1991 and its Head Quarters is located in Gujarat University Campus, Ahmedabad. Earlier it was started as a project under the IUCAA, Then it became an independent Inter-University Centre in the year 1996.

INFLIBNET works towards modernizing university libraries in India and linking them as well as information centres in the country through a nation-wide high speed data network with the use of

state-of-art technologies for the rational use of information. Soon INFLIBNET has become a major player in accelerating scholarly communication among academicians and researchers in India.

Objectives The primary objectives of INFLIBNET

1. To cultivate and set up communication facilities to enhance capability in information transfer and access, to reinforce scholarship, learning, research and academic pursuit by co-operation and involvement of respective agencies.
2. To form INFLIBNET: Information and Library Network a computer communication network for linking libraries and information centres in universities, deemed to be universities, colleges, UGC information centres, institutions of national importance and R & D institutions etc. Minimising efforts duplication.

Internet

The full form of Internet is Inter Network Systems. It is a worldwide network of networks and hence comprises of millions of interconnected computer networks. The growth of the Internet is phenomenal. The Internet is considered as a phenomenon unparalleled since the emergence of the printing press that ushered in a revolution in the production, circulation and integrating of information. The technical foundation of the Internet allows it to keep expanding almost indefinitely. The Internet has been compared with a tidal wave that will wash over the computer industry and many others and drowning those who don't learn to swim in its waves.

As the computer has become a part and parcel of modern offices the Internet will force itself into the very texture of our life by the turn of the century. For millions of users the world over, Internet has become a means of cross-border transfer of information. It provides an ease in the direct contact between researchers from various countries. It is an outstanding means of communication. It offers an opportunity to every individual to exercise power in a way that no information framework has ever provided. Information put on the Internet becomes easily available and which can be accessible to millions of individuals. No single individual or organisation have the Internet. Its management is fully decentralised. It is thoroughly managed by individual and organisational volunteers. Each network meets the expenses for the installation and operating costs as well as those of connecting up with other networks.

Uses Of The Internet

Zillions of services are available on the Internet. It has come to be the single unparalleled device for finding solutions to all sorts of problems. Image, sound and text travel easily on the Internet. Users from all over the world can discuss back and forth. The Internet can arrange a round table conference at much lower cost. It has already become a new source of business. Some crucial applications of the Internet are: E-mail: E-mail is the most widely used Internet service and it has eliminated the distance factor. To send a message through E-mail one has to type a message and it would travel instantly over the network to whomever one wishes. An electronic mailbox that is an address, which mentions the source or destination of an electronic mail message is the essence of electronic mail. The mailbox acts as a storage area that sustain all the messages til the user reads it. An e-mail message can comprise text, graphics, voice and video.

FTP: File Transfer Protocol (FTP), a client-server protocol allows a user on one computer system to transfer files to and from another computer system over a TeptIP network irrespective of the platforms the users or the host remote site are using provided the user knows the address of the host

computer and has some kind of idea of the information stored there. Usenet: Usenet initially implemented in 1979 − 80 has grown to develop as the greatest decentralised information utility in existence. It encompasses government agencies, universities, high schools, business houses of all denominations and individuals.

Usenet has emerged as one of the crucial segments of the Internet. There are numerous topics. A typical Use net message may contain plain text and or encoded binary information. Each message has a series of headlines which defme the source bfthe messagc, its destination, time and location of posting, what route it has taken over the network and 80 on. Communicating interactively in real time: It is possible to speak (VOICE) in real time on the Internet provided one uses the right kind of software.
The quality of the audio depends on the application, the speed of the computer and the compression method used. Standard compression protocols are: CSM, CVSD AND RTP. In a full duplex conversation, one can speak and hear the other person at the same time. In half duplex, only one person can speak at a time.

TelNet: One can use other computers via the Internet by using TeLNet-one of the most crucial protocols of the Internet. TelNet provides the user an opportunity to be on one computer system and do work on another-which may be very near or thousands of kilometers away. Acquiring software; The Internet is the world's biggest software library and it is possible to acquire software from the Internet. The software which are available free from the Internet are known as freeware and another kind is known as shareware software which is available for nominal charge.

World Wide Web (WWW):
There is an incredible amount of information on the Internet and it is growing exponentially. As any individual or organisation does not control the Internet there is no master record of its information resources. WWW, a product of the continuous search for innovative ways of searching information, is a mechanism that links together information stored on many computers throughout the world. One of the crucial characteristics of the WWW documents is their hypertext framework created by Hyper Text Markup Language (HTML) a simple data format. HTML lets one easily link words or pictures in one document to other documents and the resulting hypertext documents are portable from one platform to another.

HTML works on matter where the documents are stored-whether in the same computer or elsewhere on the Net. One will just have to click on a phrase or icon in t he first document with one's mouse for the Internet to avail the related documents on the computer's screen. The system requirements for running a WWW server are minimal. WWW provides a way to interconnect computers running various operating systems. The simplicity of the HTML used for interactive documents allows a user to contribute to the expanding database of documents. The possibilities for hypertext in the WWW environment are endless.

Issues Of Concern
1. As the Internet is growing 80 are host of ethical concerns abo ut it. Certainly researchers and scholars-the early users of the Internet-would like to protect the Internet from censorsh ip. But law-enfoL'cing age specially in those countries where the Internet is widely used are considering means to curb impersonators, pirates and other improper users. Currently, censorship is basically done to protect the children against undesirable matters and topics.

2. Advertisement on the Net is one of the major issue. Because of its interactive nature it is persuasive in nature.

3. In the starting, everything that was available on the Net was free. It was intended to provide help to researchers around the world. But as the popularity of the Internet is growing a number of pay-service networks are appearing.

4. Issues regarding copyright and security have already surfaced.

5. The continuation of the Internet as a democratic information infraframework looks to be a problem by the unsocial web-based terrorists who attempt to spread disinformation and the software giants who are trying to define the Webonomics.

6. Some people consider that Internet may eventually end up in being a medium of ideological propaganda. However, such concerns do not seem to the well founded unlike other technologies of the past it is decentralising rather than a centralising force.

7. The rising popularity of the Internet is creating traffic jams and at certain times of the day the networks are so crowded that it is practically impossible to connect with certain server. The Internet is still evolving. The real Internet of the future may bear very little resemblance to today's Internet. The growth of the Internet has not followed any specific path in the past. But one thing about its future can be said with certainty that it has aimed to become extremely successful and exponentially faster.

Software Development

Solicitware developing, also called programming is problem-solving process. Generally comprise of the core steps stated below:

1. Mention the problem: To quote the problem clearly without any confusion.
2. Elaborate the problem: To find out the relevant outputs.
3. Design algorithm: To develop a list of steps, called an algorithm, that will initiate with the input and stop with the output:
4. Use algorithm: To write a program in a language as per the algorithm.
5. Test the program: To verify that the program indeed cultivates the desired result in selected testing cases.
6. Maintain the program: To update the program according to new information. Steps in the above mentioned procedure have to be performed again to rectify the errors found meanwhile the process.

Example : Kilometer-mile translation.
a. Specify the problem: a survey of maps, some with distances in kilometer, while others with miles. All result should be in kilometer.
b. Analyze the problem: Distance in miles should be converted into kilometers. The relation is one mile equals 1.609 kilometer. Hence, the input is a miles value. The output is the corresponding kilometer value.
c. Design the algorithm: There are three steps:
1. *get the distance in miles*
2. *times 1.609 to that number*
3. *show the result.*

d. Use the algorithm.
e. Test the program: Run it with several distances in miles as input, then check the output.
f. Maintain the program: Irrelevant for this problem.

World-Wide Web
Its Uses as a Teaching Tool 'World-Wide Web represents a new concept in technology, the library on your desktop, the dictionary at your fingertips, the sound at your ear. Everthing is widely available on WWW' Why Use the Web? The World-Wide Web (or the Web) is one of the most accessible tools available for academician to use. It allows an easy means of publishing material, it has a low learning curve, the majority of its browsers are graphical and user friendly, and above all it is free to most people in Higher Education.

The Web works on a client-server principle. The user launches their browser (e. g. Netscape) on their machine, which in turn interrogates a server retrieving files. Files are located via their Uniform Resource Locator (URL) -a unique address detailing the protocol for transferring the data, the domain name of the Web server, and the pathname/filename of the actual document. The Web presents a head-on comparison with traditional multimedia-authoring tools such as Tool Book, HyperCard. Director, and 80 on.

Academies who wish to create simple computer aided learning courseware often face the decision of whether they should go down the path of learning a multimedia-authoring tool and distributing the material on a CD-ROM or floppy disk; or whether they should move to the Internet and use the multimedia and hypertext functions of the Web.

Advantages of the Web
1. It is regarding the use of Web server (generally your institution's mainframe), publication of material (not comprising copyright costs) IS free.
2. The mark-up language i.e.. HTML is widely used in forming World Wide Web documents.
3. The Web works on a non-propriety standards ASCII, giving the site a longer life expectancy: Text is in plain ASCII. HTML is a sub-setol SGML, graphics appear 8S JPEG or GIF, etc. It is subsequently cross-platform i.e.. The same document can be seen through a Macintosh, a Windows machine, a UNIX box and even a useless terminal, using such browsers as LYNX though this focuses on the loss of multimedia elements.
4. When it is formed, the material and information are available even for the millions of international audience with no extra costs.
5. Connecting from the document is not confined to data elsewhere on the machine's hard drive or the CD-ROM the program is distributed on, but can be international, In turn if you are forming a virtual atmosphere for your students, the Web will allow to link with a great ease to other Universities.
6. Software that are being required for the Web is absolutely free in most of the parts. The potential audience is limited by the distribution process (e. g. Cost and speed of producing CD-ROMs), and the platform requirements, cases (both browsers and servers) or very cheap, and are easy to use. The Web can deliver multimedia (comprising video and audio) elements along with text. Also, plug-ins for the different browsers permit users to interact and communicate with VRML sites.
7. If the product is updated this would have to be in conjunction with a re-issue of a new version.
8. Advertising these changes with a renewed round of distribution.
9. Also software houses have made outstanding Editing of the existing files well straight-forward. Also, as it works on a client server basis there is no onus on the developer to reo issue upgrades.

Disadvantages of the Web

1. At present, the screen design helps and animation capabilities of the Web are not as advanced as those provided with most of the authoring packages. However, Macromedia's Shockwave goes someway to focusing on this; as does Java; or the more user friendly JavaScript. Cascading style sheets may help the screen layout process in the future.

2. Usage of networks is sometimes too slow (probably the most consistent criticism leveled at publishing on the Internet). However, in answer to this, it should not be forgotten that HT11L flies can be read from local networks or bard drives thus dispensing with the reliance on the speed of the Internet. Academics wishing to give online tutorials or notes through the Web could even distribute their files on floppy disks.

3. By opening up its usage to the international audience there are complicated implications for copyright issues. A developer who wants to publish on the Web will needs to attain the world rights on the material or matter, Which he will going to use. But one should keep in mind that even, the technical problems are present in the Web but they all are being pressed under the advantages of it, making it a more attractive prospect for the development of CBL material than traditional multimedia authoring packages though the manufacturers of the latter are continuously focusing on the ways to deliver traditional multimedia packages with Web browsers.

Multimedia

To assure more clarity in minds, It is essential to list up the advantages and disadvantages of multimedia authoring tools (MM) when it is compared with the Web, They are stated below-

Advantages of MM authoring

1. Many of them contain sophisticated editing tools and background scripting languages.
2. Most will allow run-time versions to be distributed without the need for third parties to have the complete version of the software they were created in e. g. HyperCard player, etc.
3. Because of the vast history of development there are 8 substantial amount of helping material and publications to help the desired author.
4. The author must have complete control over the data, limiting its distribution as well as the end-users'capabilities to change material.

Disadvantages of MM authoring

1. Every authoring package has its own disadvantages; often confined to a single platform: Lacks in handling hypertext.
2. The author develops specific importing characteristics, most of the data used in the final product will be locked into the package making significant editing in a problem.
3. The expectancy of life through these products is a matter of concern, strides in making the authoring software made easy to use, it should still keep in mind that the learning curve for some topics is very large.

Telecommunication

The INSAT system for telecommunication, television broadcasting and meteorology has received a great success during the year with the successful launch ofINSAT-3C on January 24, 2002. INSAT-3C will not only augment the present INSAT system but also continue the services of some of the satellites that need to be phased out at the end of their mission life.

INSAT is one of the largest domestic communication satellite systems in the world with five satellites, INSAT-2C, INSAT-2DT, INSAT-2E, INSAT-3B and INSAT-3C. The INSAT system also consists a few transponders leased from other agencies for meeting the current demands. Planning of IN SAT-4 series of satellites has been started firstly on the basis of detailed discussions with the various users. Seven satellites are proposed in the INSAT-4 series. Experimental communication satellites, OSATa, are built, which are launched during the developmental test flights of GSLV.

Besides the use of INSAT for telecommunication, broadcasting and meteorological services, focus must be on utilising the system for grassroots level applications like developmental communication and satellite based training. New initiatives'have been taken for utilising INSAT for introduction of tele-medicine to make speciality treatment accessible to the population an remote areas. The Indian remote sensing satellite system, IRS, which has the biggest constellation of satellites, continues to give space-based remote sensing data for 8 number of applications in India and abroad. Currently, IRS system has five satellites namely, LRS-lC, IRS-1D, IRS-P3, fRS-P4 (OCEANSAT) and Technology Experiment Satellite (TES).

The TES has given further fillip to advance the technology of remote sensing in India. It has enabled testing new satellite hardware and demonstrating newer remote sensing techniques. It focuses on a panchromatic camera giving a spatial resolution of up to 1 m. Remote sensing satellites like RESOURCESAT, CARTOSAT-I and CARTOSAT-2, is progressing well.

They will not only continue the services of the present IRS satellites but 8. Lso enhance the service capabilities. CARTOSAT-l is already in service. The remote sensing applications continue to expand to several new areas; the data has been used to assess damage due to floods, earthquakes, etc. And for helping in relief operations. Remote Sensing Data Policy (RSDP) was announced which helps in streamline the availability of remote sensing data from indian and foreign satellites to users in India. The launch of two satellites. One of Belgium and another of Germany on board PSLV marks an crucial event during the year under commercial marketing of India's space capabilities. Data from IRS satellites continue to be received by various ground stations worldwide. The lease agreement of transponders on board INSAT-2E to INTELSAT remain continued.

Space Transportation

Space Transportation system consists the satellite launch vehicles to place satellites like I NSAT and IRS and scientific satellites in the requisite orbits as well as the sounding rockets for carrying out short duration scientific experiments. India made a modest beginning in this area with the launch of a 75 mm diameter sounding rocket in 1963 for investigation of ionosphere over the gee-magnetic equator over Thumba, near Thiruvananthapuram.

Since then, India has attained an image of substantial capability in the design, development and operationalisation of a series of sounding rockets for scientific investigations, Polar Satellite Launch Vehicle, PSLV, for launching Indian remote sensing satellites and Geosynchronous Satellite Launch Vehicle, GSLV for launching geostationary communication satellites.

Earth Observations System

Earth Observations System i.e.. EOS is a crucial space infrastructure that has been instituted by the Department of Space (DOS). The system, which was commissioned in the year 1988 with the launch of Indian Remote Sensing Satellitte, IRS-1A, has the worlds largest constellation of five satellites IRS-C, IRS-1 D. IRS-P3, IRS-P4 and TES presently in operation. It gives space-based remote sensing data in a variety of spatial resolutions and spectral bands meeting the needs of various applications.

The EOS definition, development, operation and its use are co-ordinated by the National Natural Resources Management System (NNRMS), for which DOS is the nodal agency. NNRMS is an integrated resource management system which aims for the optimal utilisation of country's natural resources by a relevant and systematic inventory of resource availability using EOS data with conventional techniques. NNRMS is supported at the national level by the Planning Committee of NNRMS (pC-NNRMS), which gives guidelines for use of the system and also over-sees the development of remote sensing applications for natural resources management in the country.

The NNRMS activities are headed by ten Standing Committees, which are stated below-

1. Agriculture & Soils
2. Bio-Resources
3. Geology and Mineral Resources
4. Water Resources
5. Ocean Resources
6. Cartography & Mapping
7. Urban Management
8. Rural Development
9. Technology & Training
10.Meteorology

Follow-On Satellites For Earth Observation

IRS-P6 (RESOURCESAT-l) IRS-P6 (RESOURCESAT-l) is launched by PSLV in 2002 − 03. It will carry the payloads, which are stated below:

IRS-P6 will not only provide service continuity to IRS-1C and IRS-IO but also enhance the service capabilities in the areas of agriculture, disaster management, land and water resources, with better resolution imageries. mS-P5 (CARTOSAT-1), lRS-P5 is launched by PSLV in 2003 − 04. The satellite is primarily intended for advanced cartographic applications. IRS-P5 will have two panchromatic cameras on board with 2.5 m resolution with a swath of 30 km each. These cameras are mounted with a tilt of + 26 deg and-5 deg with the track with respect to nadir to provide stereo pairs of images needed for the generation of Digital Terrain Model (OTM)/Digital Elevation Models (OEM) of the required regions. The data products will be used for cartographic applications, cadastral mapping and updating, land use and other GIS applications. The satellite has a revisit capability of 5 days, which can be realised by steering the spacecraft about roll axis by 26 degrees. During tbe year tbe equipment panel design bas been finalised. Various components are under development and testing.

Ground Segment: The ISRO Telemetry, Tracking and Command Network (ISTRAC) monitors and controls aU the IRS satellites besides other low earth orbit satellites. ISTRAC has a network of ground stations located at Bangalore, Sriharikota, Port Blair. Thiruvanantapuram, Mauritius and Bearslake with multi-mission Spacecraft Control Centre at Bangalore. Currently, TIC stations at Brunei and Biak have also added. ISTRAC. At present tra. Cks, monitors and controls IRS-IC, IRS-ID, IRS-P3, JRS-P4 and TES. ISTRAC was ultimately used for organising various demonstrations on TES. Payload operations on IRS-IC and IRS-ID are carried out over the Inman stations at Shadnagar in India as well as foreign data reception stations at Fairbank (USA), Seoul, Korea, Cotopaxy (Ecuador), Dubai, NeustraJitz (Germany), Norman (USA), Tokai (Japan) and Riyad (Saudi Arabia).

On an average about 350 to 400 payload operations are being operated per month. IRS-P3 payload operations are operated for about 250 times per month over Shadnagar in India, Neustralitz and Wallops (Germany) and Maspolamas (Spain).

1. A multi-spectral camera USS-3 giving 23.5 m spatial resolution in four spectral bands with a swath of around 140 km.
2. A high resolution multi-spectral camera LISS-4 giving 5.8 m spatial resolution operating in three spectral bands.
3. An Advanced Wide Field Sensor (A WiFS) with spatial resolution better than 70 m in three spectral bands and giving a swath of 740 km.

Satellite Data Acquisition, Processing And Dissemination

The National Remote Sensing Agency (NRSA), Hyderabad, continues to get remote sensing data from the Indian satellites, IRS-IC, IRS-lO, IRS-PS, IRS-P4 and the TES as well as the US NOAA-14, Landsat-5 and European ERS-2. The Data Reception Station (ORS) of NRSA at Shadnagar, has been further augmented to get data from TRS-P5 (CARTOSAT) and IRS-P6 (RESOURCESAT).

Aerial Remote Sensing: NR5A operates two aircraft that have been modified for multi-sensor operation with high performance work station and digital photogrammetry system to form data products. Aerial remote sensing services provided by NRSA is availed by various agencies for aerial photography, mapping, infrastructure planning, aeromagnetic surveys, large scale base maps and topographic and cadastral mapping. Some of the aerial surveys carried out consist aerial photography of nine towns of Gujarat that were affected by the earthquake in January 2001, twenty seven towns in Andhra Pradesh, seven districts in Madhya Pradesh, three towns of Rajasthan, Bangalore peripheral areas and flood affected areas of Orissa.

Low altitude flight for airborne geophysical survey for Atomic Mineral Division and nights carrying Synthetic Aperture Radar have also been carried out. Re mote Sensing Data Policy: The Government has announced, a Remote Sensing Data Policy (RSDP) in order to streamline the availability of remote sensing data from Indian and foreign satellites to users in India. As per the RSDP. Government's permission will be required for operating remote sensing satellites in India and for distribution of satellite images in India. The NRSA, Hyderabad, will be the national acquisition and distribution array for all satellite data within India. NRSA can enter into agreements for distribution of data from foreign satellite in India.

Antrix Corporation, the commercial agency under the Department of Space, will license the use of IRS capacities outside India. The announcement of RSDP is an crucial step pertaining to making transparent. The procedures of satellite data distribution, consisting those from high resolution imaging systems. I t would help to alter the process of image distribution so that Indian users are not denied access to valuable satellite based imageries, which can be used in the development of natural resources. Remote Sensing Applications: Space-based remote sensing, because of its synoptic and repetitive coverage of large areas as well as providing data in a quantifiable manner has enabled monitoring and assessment of different natural resources.

Today space-based remote sensing is used for various areas of resources, survey and management. Projects of national relevance in different application themes are being carried out with the involvement of user agencies at central and state levels. Some of the core applications to which remote sensing is being used in the country are focused in the paragraphs.

Crop Acreage And Production Estimation (CAPE): CAPE was designed in the year 1995 with the sponsorship of the Department of Agriculture and Cooperation. Under this project, multi-date lRS satellite data are used for pre-harvest acreage and production estimation for core food crops as well as cotton. The estimates are provided far kharif rice in Bihar. Rabi dee in Orissa, mustard in Assam, Gujarat, Haryana, Rajasthan and West Bengal, wheat in Bihar, Himachal Pradesh, Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh and sorghum in Maharashtra.

FASAL: Based on the success of CAPE. An enlarged and comprehensive scheme known as Forecasting Agricultural output using Space, Agrometeorology and Land based observations (FASAL) bas been taken up. FASAL now covers kharif rice in Orissa as a pilot project as well as forecasting kharif rice production at the national level. It is proposed to set up a FASALNCCF (National Centre for Crop Forecasting) under the aegis of the Ministry of Agriculture. Drought Assessment and Monitoring: Based on the data collected by the satellites on the vegetation indices and ground based information, fortnightly bulletins on crop conditions depicting agricultural drought are being issued for eleven slates, and at sub-district level during kharif season. Flood Mapping: The Flood Mapping. Using satellite imageries are being undertaken since 1987 to help Department of Agriculture and Cooperation and State Relief Agencies and Central Water Commission. Under this, flood prone river basins of Brahmaputra, Kosi, Ganga, Indus, Godavari and Mahanadi are covered and near real time inundation and damage estimation maps are formd. Forest Monitoring: The Forest Survey of India carries out the forest cover mapping on 1: 250, 000 scale on a biennial basis. Karnataka, Andhra Pradesh and Maharashtra have used satellite based dala for preparation of forest working plans.

A biodiversity characterisation at landscape level has also been taken up in four regions of the country, namely, North-Eastern Himalaya, Western Himabya, Western Ghats and Andaman and Nicobar Islands. The activities related to preparation ofbiome level ecological zone maps and topographical details are nearing completion. The project is being undertaken with the sponsorship of the Department of Biotechnology. A few medicinal plant colonies in the Himalayas like Hyppophae rhamnoides, Ephedra gerardiana and Taxus baccata have been mapped. Irrigatron Command Areas: Under the sponsorship of the Central Water Commission, 14 large irrigated commands covering five states (Andhra Pradesh, Assam, Maharashtra, Rajasthan and West Bengal) extending to an area of 3.12 Mha (million hectare) have been taken up for monitoring using satellite data. So far evaluation of seven command areas has been completed.

Snow-melt Run-off Prediction: Forecasting and monitoring of Snow-melt Run-off for the Satellite River Basin is being carried out since 1994 with the sponsorship of Bhakra-Beas Management Board. The forecast is made every year by the first week of April, which is further updated subsequently.

Integrated Land and Water Resources Development: Generation of data for Integrated Mission for Sustainable Development (IMSD) for 84 Mha area covering 175 districts located in 28 States have been completed and similar work has been extended to Koraput-Bolangir-Kalahandi (KBK) region of Orissa. The Department of Land Resources under the Ministry of Rural Development is now working pertaining to institutionalising IMSD for implementation.

Wasteland Mapping: The Wasteland Mapping has been carried out in five phases during 1986 − 2000 on a 1: 50, 000 scale under the sponsorship of the Department of Land Resources under Ministry of Rural Development.

Space Science And Communication Milestones

1962: Indian National Committee for Space Research (INCOSPAR) established by the Department of Atomic Energy and work on establishing Thumba Equatorial Rocket Launching Station (TERLS) started.
1963: First sounding rocket launched from TERLS (November 21, 1963).
1965: Space Science & Technology Centre (SSTC) established in Thumba.
1967: Satellite Telecommunication Earth Station set up at Ahmedabad. 1968: TERLS dedicated to the United Nations (February 2, 1968).
1969: Indian Space Research Organisation (ISRO) established under Department of Atomic Energy (August 15, 1969)
1972: Space Commission and Department of Space set up. ISRO brought under DOS (June I, 1972).
1972 − 76: Air-borne remote sensing experiments.
1975: ISRO becomes Government Organisation (Ap, il1, 1975). First Indian Satellite, Aryabhata, launched (April 19, 1975).
1975 − 76 Satellite Instructional Television Experiment (SITE) conducted.
1977 Satellite Telecommunication Experiments Project (STEP) carried out:
1979: Bhaskara-I, an experimental satellite for earth observations, launched (June 7, 1979). First Experimental launch of SLV-3 with Rahini Technology Payload on board (August 10, 1979). Satellite could not be placed in orbit.
1980: Second Experimental launch ofSLV-3. Rohinisatellite successfully placed in orbit (July 18, 1980).
1981: First developmental launch of SLV-3. RS-Dl placed in orbit (May 31, 1981) APPLE, an experimental geo-stationary communication satellite successfully launched (June 19, 1981). Bhaskara-II launched (November 20, 1981).
1982: INSAT-lA launched (April 10, 1982). Deactivated on September 6, 1982.
1983: Second developmental launch of SLV-3. RS-D2 placed in orbit (April 17, 1983). INSAT-IB, launched (August 30, 1983). 139
1984: Indo-Soviet manned space mIssion (April 1984).
1987: First developmental launch of ASLV with SROSS-1 satellite on board (March 24, 1987). Satellite could not be placed in orbit.

1988: Launch of first operational Indian Remote Sensing Satellite, lRS-lA (March 17, 1988). INSAT-IC launched (July 21, 1988). Abandoned in November 1989. Second developmental launch-of ASLV with SROSS-2 on board (July 13, 1988). Satellite could not be placed in orbit.
1990: INSAT-I0 launched (June 12, 1990).
1991: Launch of second operational Remote Sensing satellite, IRS-LB (August 29, 1991).
1992: Third developmental launch of ASLV with SROSS-C on board (May 20, 1992). Satellite placed in orbit. INSAT-2A, the ft. Rst satellite of the indigenously built. Second-generat. Ion INSAT series. Launched (July 10, 1992).
1993: INSAT-2B, the second satellite in the INSAT-2 series, launched (July 23, 1993). First developmental launch of PSLV with IRS-IE on board (September 20, L993). Satellite could not. Be placed in orbit.
1994: Fourth developmental launch of ASLV with SROSS-C2 on board (May 4, 199--1). Satellite placed in orbit. Second developmental launch ofPSLV with IRS-P2 on board (October 15, 1994). Satellite successfully placed in polar sun synchronous orbit.
1995: I NSAT-2C, the third satellite m the INSAT-2 series, launched (December 7, 1995). Launch of third operational Indian Remote Sensing Satellite, IRS-IC (December 28, 1995).
1996: Third developmental launch of PSLV with IRS-P3 on board (March 21.1996). Satellite placed in polar sun synchronous orbit.
1997: INSAT-20, fourth satellite in the INSAT series. Launched (June 4.1997). Becomes inoperable on October 4.1997 (An in-orbit satellite, ARABSAT-IC, since renamed INSAT. 2DT, was acquired in November 1997 to partly augment the INSAT system). First operational launch otPSLV with IRS-1 D on board (September 29, 1997). Satellite placed in orbit.
1998: INSAT system capacity augmented With the readiness of INSAT-2DT acquired from ARABSAT (January 1998).
1999: INSAT-2E, the last satellite In the multipurpose INSAT-2 series, launched by Ariane from French Guyana (April 3.1999). Indian Remote Sensing Satellite, IRS-P4 (OCEANSAT), launched by Polar Satellite Launch Vehicle (pSLV-C2) along with Korean KITSAT-3 and German OLR-TUBSAT from Sriharikotn (May 26, 1999).
2000: I NSAT-3B, the first satellite in the third generation INSAT-3 series. Launched by Artane from Kurou French Guyana (March 22, 2000).
2001: Successful light test of Geosynchronous Satelhte Launch Vehicle (OSLV) (April 18, 2001). with an experimental satellite GSAT on board. Successful launch of PSLV-C3 (October 22, 2001) placing three satellites India's TES, Belgian PROBA and German BI RD. In to Polar sunsynchronous orbit.
2002: Successful launch of INSAT-3C by Ariane from Kourou. French Guyana (January 24, 2002). ISRO's Polar Satellite Launch Vehicle, PSLV-C4, successfully launched KALPANA-l satellite from Sriharikota (September 12, 2002). Succcssful launch ofINSAT-3A by Arlane from Kourou French Guyana (April 10, 2003), The Second developmental launch ofGSLV-02 with GSAT-2 on board from Sriharikota (May 8, 2003). Successful launch of INSAT-3E by Ariane from Kourou French Guyana (September 28, 2003), ISRO's Polar Satellite Launch Vehicle, PSLV. C5, successfully launched RESOURCESAT 1 (lRS-P6) satellite from Srihankota (October 17, 2003).

India launches EDUSAT the ultimate satellite for educational services (September 2004). India has become the potential of space science and technology for the socio-economic development of the society soon after the launch of Sputnik by erstwhile USSR in 1957. The Indian space efforts started in the sixties with the establishment of Thumba Equatorial Rocket Launching Station near Thiruvananthapuram for the investigation of ionosphere using sounding rockets. The Indian Space

Research Organisation (ISRO), was established in the year 1969 under the Department of Atomic Energy.

The Government of India gave fillip to the space activities by formally setting up Space Commission and the Department of Space (DOS) in June 1972 and ISRO was also brought under Department of Space. Over the last three decades, India has achieved an enviable progress in the design, development and operation of space systems, as well as using the systems for vital seryices like telecommunication, television broadcasting, meteorology, disaster warning and natural resources survey and management.

The space programme has become largely self-reliant with capability to design and build its own satellites for providing space services and to launch them using indigenously designed and developed launch vehicles. The successful first test flight of Geosrynchronous Satellite Launch Vehicle (GSLV) from Sriharikota on April 18, 2001 was the most significant milestone of the Indian space programme. The launch unequivocally demonstrated India's capability to place satellites into geo-synchronous transfer orbits. India is among the 6 nations in the world to achieve such a capability.

The launch of OS LV is the culmination of efforts of various DOS centres and other institutions that involved complex interfaces between scientific and technological disciplines, industries and research institutions. Another crucial milestone during the year was the succeasfulflight of PSLV-C3 on October 22, 2001 from Sriharikota. In this fifth consecutively successful flight, PSLV placed three satellites-India's Technology Experiment Satellite, TES, Belgian PROBA and German BIRD into their intended polar sun-synchronous orbit. The requircment of a higher orbit for the Belgian PROBA compared to other two satellites was successfully met by a flight manoeuvre. Both German and Belgian satellites were launched under commercial agreements.

Wastelands

India's wasteland atlas India has been instituted and information is used for planning various developmental programmes. A digital data base is also now being formed.

National Drinking Water Mission: Under the sponsorship of the Department of Drinking Water of the Ministry of Rural Development, maps showing prospective zones of ground water occurrence and recharge are being prepared on 1: 50, 000 scale ill six states (Andhra Pradesh, Karnataka, Madhya Pradesh, Chhattisgarh, Kerala and Rajasthan). So far 930 maps have been prepared out of the 1800 maps required. The maps are integrated with GIS data base and identify areas and sites for locating borewells.

Coastal Studies: Information on Coastal wet lands, land forms, land use, shore line changes, etc. have been mapped on 1: 250, 00011: 50, 000 scales for the Ministry of Environment and Forests. Coral reef maps on 1: 50, 000 scale for Gulf of Kutch, Gulf of Mannar, Palk's Bay, Lakshadweep and Andaman & Nicobar islands have been established. Mapping of the characteristics between High Tide Line (HTL) and Low Tide Line (LTL) and land use features for a strip of 500 m from HTL, on 1: 25, 000 scale, under Coastal Regulation Zone has also been carried out. The maps are used for preparing coastal zone management plans and for designing regulations on construction along HTL.

Use ofIRS-P4 (OCEANSAT) Data: An end to-end task of using IRS-P4 data for oceanographic, marine-atmospheric and coastal environmental applications has been taken up. Different agencies like Department of Ocean Development, Indian Meteorological Department, National Institute of Oceanography, Central Marine Fisheries Research Institute, etc. besides several State Departments are participating in this task. The Ocean Colour Monitor (OCM) of IRS-P4 provides data on Chlorophyll distribution and primary productivity for locating potential fish zones, sea surface velocities, suspended sediment movement, coastal landforms, coral reefs, etc. The Multi-frequency Scanning Microwave Radiometer (MSMR) on board the satellite gives data on humidity over oceans, water vapour content, winds, rain rate, fluxes, sea ice, etc.

Disaster Management: Landslide Hazard Zonation (LHZ) Mapping: Landslide Hazard Zonation (LHZ) mapping on 1: 25, 000 scale is being carried out for all core pilgrim and tourist routes in the Himalayan region in Uttaranchal and Himachal Pradesh. Database has been formed for the entire 2000 km long corridor and LHZ maps have been made. The routes covered include: RishikeshRudraprayag-Chamoli-Badrinath, RishikeshGaumukh, Rudraprayag-Okhimath-Kedarnath, Chamoli-Okhimath and Pithoragarh-Malpa, all in Uttarancha1; Shimla-Manali, Shimla-Sumdo and Dalhousie-Brahmaur in Himachal Pradesh.

The maps are used by State Public Works Departments (PWD), Border Roads Organisation and some NOOs. Gujarat Earthquake: The space based imagery along with aerial remote sensing provided inputs to the Gujarat State Administration during the Earthquake in January 2001 in terms of locating the worst affected towns, to assess the changes in the terrain features and damage assessment. The satellite news gathering terminal was also moved from the Space Applications Centre and establish at Bhuj which was the only link till February 2, 2001 to co-ordinate rescue and relief operation.

National (Natural) Resources Information System: A information infrastructure developed around GIS for providing an ease in the conceptual planning and decision making at District-State-National level is being came into influence for the Planning Authorities. Already NRIS has been used for 30 districts and four state nodes. The NRrs consists of 22 spatial layers and 8 non-spatial layers in the context of natural resources as well as socio-economics. 3 broad categories of wastelands are stated below: Barren rocky sheet rock. Gullied areal ravines. Mining Industrial wastelands.