CHAPTER-II

INFORMATION AND COMMUNICATION TECHNOLOGY – ITS NATURE, AIM, SCOPE AND UTILITY

The adoption of ICT requires a business environment encouraging open competition, trust and security, interoperability and standardization, and financial resources for ICT. The digital divide can be narrowed and poverty reduction can be addressed through effective and focused utilisation of ICTs in key sectors such as education, industry, agriculture, employment etc. This requires the implementation of sustainable measures to improve access to the internet and telecommunications infrastructure and increase ICT literacy. The goal of ICT in India can be to establish an environment that encourages networking of services and applications, promoting e-commerce and trade promotion programmes for goods and services, promoting internet access to exchange and access digital content, establishing e-government, promoting education and online services, strengthening network security, building and developing e-society and ICT human resources.

Nature of ICT:

Information and communication technology is technique for data capturing, data storing, data processing, data transmission, information retrieval and information display and communicated the results either in the form of model or attribute or in combined form through computers. Thus the information and communication technology is a collective form to combine field of computers and various information systems to find out the desired solutions to the users. It has affected every walk of the human life at local, national and global level. If a person or an organisation attempts to achieve certain objectives it cannot remain aloof from the developmental effect of information and communication technology. In such a condition the role of information and communication technology varies from place-to-place, person-to-person and organization-to-organization at different levels. Its nature, function and effect
depends either on the individual or the organizational need of information (Prasad & Prasad, 2009).

The ICT has revolutionized the entire gamut in which people live and work. It has changed all aspects of human life and lifestyle. The digital revolution has provided the ability to process data related to various kinds of information with more precision, accuracy by manipulating and simulating. These capabilities are bringing into being a whole world within and around the physical world. Computers and communications are becoming integral parts of our lives.

Up to 1960s communication was used to be between people – one person to another. But in last decade the global arena has witnessed a tremendous growth in the area of ICT (Leon & Leon, 1999). Rapid advances in the technologies for communication media like television, computer, internet, printing and publishing has enabled us to get prompt access to required information. The computer with various computer languages such as C, C++, Java, .Net etc. have made easier to process informations collected from various sources. The government departments, business organizations, scientists and academecians all retrieve computer based information. The computer based informations is used for solving intricate scientific problems to art, cultural, historical, accounting, financial, medical and even domestic sectors. Hence, with information and communication technology the computers has made a significant impact on all dimensions of our day to day life, e.g. reservation of air and railway ticket, buying and selling items on the internet, electronic market, bank transaction on net, entertainment, education, communication, reservation and so on. ICT has replaced the conventional methods to solve technical and operational problem by introducing a much faster and more convenient methods based on its ability to access large and complex pool of data.

Initially computer could process information contained in the form of text only. A text is written with letters, digits and other characters which you can read. Later it was also realized that the information contained in the form of images, animation, audio, video can also be processed. The pressing demand for storage and retrieval of data represented in multiple forms like Text, image, animation, graphics, audio, video has given a given new direction to computer scientists
and technologists to process information stored in multiple formats. All this has revolutionized ICT.

ICT is a generic name for the following functions:

1. Information / data representation.
2. Information / data storage.
3. Information / data retrieval and processing.
4. Information / data communication.

**Level of Information and Communication:**

The information and communication level varies from users – to – users accordingly to meet their requirements. The followings are the essential level of information (Mittal, 2005):

The **International** information is necessary for the large organizations, government policies formulation, currency exchange rates, business trends etc.. For this business portals, web sites and from other various domains. For this telecommunication plays vital role.

**National** information is required for the individuals, government, semi-government, non-government and private organizations to control the law and order and to administer under their jurisdictions. In India, National Information System (NIC) has taken burden to provide national level information. Magazines, newspaper, TV channels, web sites also serves this purpose.

**Corporate Information** is specially related to specific organization itself. It is an in-house information system specially to convey the employees, to customers or to the share holders. It helps to establish a friendly relationship between the management and employees, customers and share holders. The corporate information consists of financial statements, magazines and reports. Such an information gives the idea of the capability of the organization to withstand the competition of the market. Hence for good administration, better management and benefits, the corporate information is best suited.

**Departmental Information** - To have a good management instead of having the organization as a single unit, it is better to divide into various departments. To achieve the goals
and formulate the strategies for better set up or organization or system departmental information is only the most effective way. Hence, either government or a business organization set up various departments for better management through collecting information with the help of communication and other sources.

**Individual Information** includes the information about the staff members and employees of an organization. It emphasizes on the personal information, such as residential status, marital status, family structure and size, medical history, educational level, salary structure etc.. This information is utmost necessary to improve the welfare condition of an individual so that an organization or government may be able to provide best suited options to improve the well being of the individual.

**Functions of Information and Communication Technology :**

ICT performs a variety of functions. The major functions are as follows:

**Data Capture** – Data capturing, storage and transmission is important function of ICT. For getting information and developing information system of any activity data is utmost essential which is captured with the aid of computer devices such as hardware and software. Usually data is captured by keyboard, bar codes, video camera, mouse etc..

**Data storage** – Data storage within the framework of ICT is an issue of covering space. It depends on following two factors.

1. Disk space availability.
2. Flexibility of ICT in terms of making the data available for use.

ICT data is stored in storage media for later retrieval. Computer systems translate all data and instructions into binary form (0,1) for storage purpose. For data storage various memory devices such as magnetic tapes, floppy disk, hard disc, pen drive etc. are used. Although disk storage is less critical and it is still a constraint. The ICT software on a micro computer can occupy tens of gigabytes.
Data transmission – Through ICT data can be transmitted from one place to another place or from one computer to another computer. For this purpose various devices like modem, cables are used. For transmitting data, various types of networks like Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), internet, intranet, extranet etc. are used.

Data Processing – Data processing is the method of conversion of data into meaningful information. The processing is done in series of operations which converts inputs i.e. data either in the form of spatial (geographical maps, images, satellite imageries, aerial photographs etc.) or in the form of attribute (tabular data collected from in-situ survey, government records or personal observations etc.) into output i.e. information in the form of three dimensional model or in other visual forms. The central processing unit (CPU) play a vital role in it.

Data Manipulation – Data manipulation is the process of summarizing, re-arranging, re-forming or mathematical calculations performed either manually or by computer software. ICT helps in manipulating the data and creates new information from existing informations.

Data Retrieval – Data retrieval is the process of finding required information. ICT supports the retrieval of informations either in the form of features or attribute or both in a simulated form. Previously it was done and managed separately but technological advancement perform more sophisticated manipulation retrieval and analysis which makes easier to link various data of different kind of informations in a single platform. Data can be retrieved from one source to another source with the help of computer software. For this data query involves the use of data values to display and analyze both the alpha numeric and graphical data within an ICT framework.

Data Display – Data display involves presenting of information in the form of text, graphics, audio, video etc.. Display can be made through computer screen, speakers and printers. (Prasad & Prasad, 2009).
Scope of ICT:

Information and Communication Technology consists of two converging technologies:

**Computation technology**: It provides a capability for processing data to be converted into information.

**Communication technology**: It enables the required information to be coded and transmitted through communication channel for intended users.

Information and communication technology is an integration of computation system, communication technologies and process for generation of information and dissemination. This synergetic integration is achieved by the convergence for computer and electronic communication. Hence information and communication technology is not only a single technology rather it is a comprehensive approach of using the computation and communication technologies. Computers represent the computation technologies and other processing systems while communication technologies are represented by a combination of methods and modes for electronic data transmission (Gupta and Srivastava, 2008).

Information and Communication Technology can help to identify the critical areas for competitive advantages for business organizations. Competitive advantages may be achieved by various techniques in business with the help of information and communication technology. It can help to manage the value chain by strategic alignment of critical business process. It helps the managers in their decision making and operational control.

Scope of ICT in agriculture:

The application of **information and communications technology (ICT) in agriculture** is increasingly important. e-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (IT) in the rural domain, with a primary focus on agriculture. e-Agriculture is a relatively new term and we fully expect its scope to change and evolve as our understanding of the area grows. The following elements of ICT can be beneficial for e-agriculture.
1. **Wireless technology** – for dissemination of agricultural information in the far flung areas of the country with poor wired connectivity.

2. **Global positioning system (GPS)** - provides benefits in geo-fencing, map-making and surveying. Eg. Using the technology of SMS and GPS, the elephant can roam freely and the authorities are alerted whenever it is near the farm.

3. **Geographic information system (GIS)** - GIS are extensively used in agriculture, especially in precision farming. Land is mapped digitally, and pertinent geodetic data such as topography and contours are combined with other statistical data for easier analysis of the soil. GIS is used in decision making such as what to plant and where to plant using historical data and sampling.

4. **Computer-controlled devices (automated systems)** - Automatic milking systems are computer controlled stand alone systems that milk the dairy cattle without human labor. The complete automation of the milking process is controlled by an agricultural robot, a complex herd management software, and specialized computers. Automatic milking eliminates the farmer from the actual milking process, allowing for more time for supervision of the farm and the herd. Farmers can also improve herd management by using the data gathered by the computer. By analyzing the effect of various animal feeds on milk yield, farmers may adjust accordingly to obtain optimal milk yields (http://en.wikipedia.org/wiki/ICT_in_agriculture).

5. **Agriculture marketing** – Marketing of agri-products can be done most efficiently by using the technology with support of various e-commerce platforms. Rural bazaar is a project developed by NIC for addressing the marketing needs of rural producers. The project is implemented in the states of Tripura, Goa and Tamil Nadu.

*Figure 2.1: ICT in agriculture leading to food security*
6. **Literacy to farmers** – Farmers can be educated through e-literacy campaign like Akshay project of Kerala government. Through this campaign Malappuram became the first e-literate district of India (Sindhi, 2011).

**Scope of ICT in education:**

ICT has huge scope in the education sector. Some of the usage of ICT in education are:

1. **Teaching learning process** – With the help of ICT, teaching learning process can be made more interactive and hence resulting in more efficient. With the help of presentations, designing and simulation several tough topics can be taught and learned in easier way.

2. **Publication** – The notes and other important documents can be digitized and hence transmitted easily. Books can easily be converted to e-books which becomes more handy and easy to carry and use its contents.

3. **Evaluation** – With the help of various softwares online tests can be done easily and the result, progress report and feedback can be received immediately.

4. **Research** – With the help of various search engines and several web sites, doing research has become easy. Moreover with the help of internet a person can have access to any library of the world and can talk to eminent scholars using e-mails, chatting, video conferencing etc.

5. **Administration** – The administration of any educational organization can be handled more efficiently with the help of various tools of ICT like CCTV, computers etc.

**Figure: 2.2: ICT in education**
Scope of ICT in society:

The society is the biggest beneficiary of ICT revolution. The scope of ICT in the society are as follows:

i. **Socialization** - With the help of ICT people are spending considerable time on social networks on the virtual world through e-mail, mobile, blogs, downloading etc. This has changed the social behavior which is the emergence of a society of digital age – the Information Society. Various social networks like facebook, twitter etc. are expanding very rapidly. The society in the digital age is constantly upgrading its personal, political and business bonds, promptly accommodating to new technologies and services. Further, videoconferencing, Skype and such have made socialization simple and more realistic.

ii. **Direct Communications** - Direct communications remain one of the main roles of the ICT. e-mail, blog, twitter, facebook etc. are some of the tools developed by ICT to facilitate cheap and efficient communication. Mobile devices, instant messengers, voice and video calls over the internet, such as Skype and others have become common low-cost option for real-time communication.

iii. **Access to Information** - Another major benefit of ICT is the easiness of accessing information. The internet has emerged as a medium of conveying information in text, visual or audible form. The ICT makes it very easy to access any information from the cyberspace on just one click.

iv. **Sharing Information and Online Communities** - Inclusiveness and openness of internet are among its greatest values. Variety of online services allows netizens to contribute and share information globally. Several online communities exist which can be joined by anyone having the common interest. The internet provides enormous potential for open discussions, knowledge sharing and production. The web pages, blogs, chatting etc are very simple ICT tools for sharing information. Many commercial websites offer users to share their videos, audios, photos or text documents which are publicly accessible and searchable across the world.

v. **Collaborative Work** - Information and communication technology has made it possible for people, who are geographically far from one another, to work collaboratively without
any physical contact. The big corporate houses, scientists, engineers etc. are using the ICT for collaborative work, which helps them cut the cost and give better results. Variety of advanced ICT services like instant chat messengers, voice-over-IP (VoIP) voice communications via internet, video-calls, webinars etc. facilitate for the remote meetings. Access to databases of institutions or groups can also be provided remotely from the server by using computers, laptops or mobile gadgets.

vi. **Mobility and Ubiquitousness** - Evolution of small devices and appliances with functionality of computers (gadgets) such as laptops, smart phones, palmtops and digital pads, all having integrated camera and microphone and the ability to connect to wireless internet, has led to increased mobility in work. Nearly ubiquitous access to information with the help of internet and gadgets allow people to stay connected and interact promptly on the events around them, often generating reactions of other interested netizens.

vii. **Learning** - The features of the online environment provided by the internet, easy collaboration, communication and documents sharing provide an excellent framework for sharing the knowledge. When the knowledge is shared, it leads to learning.

viii. **Future Society** - The emerging online application has not only changed the communication methods, but also on social habits and behavior. Growing number of internet users are becoming dependant on the online information. They search information through the online search engines (Radunovic, 2010).

Other major scope of ICT are:

**Encouraging balanced regional growth:**

ICT sector can give employment and generate revenue for smaller cities by spreading its business operations to those cities. It can assist in improving the supply of talent pool and development of physical and social infrastructure.

**Corporate Governance:**

Global exposure has created good corporate governance practices with the IT companies. This encourages other industries to follow better governance and embrace higher standards of disclosure.
Healthcare:

Health care is the world’s largest industry. India has to be prepared to meet the health care challenges of the new millennium. In today’s context health care is recognized as a system that requires a multi-pronged approach and total professionalism to achieve quality and cost effectiveness. Hospitals today have to meet the need of patients and the total focus has shifted to patient services instead of only medical and surgical therapies. Health area can have several critical and important ICT solutions like tele-medicine consultation in rural areas, consultation from expert doctors through teleconferencing or video conferencing, reports can be sent to the doctor through e-mail etc. In the developing country like India, health of its citizen is a very important issue. Application of ICT in health sector will facilitate the expansion of medical aid to far flung areas of the country.

Figure 2.3: Scope of ICT in healthcare

Source: http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/new_r_i_04m.html
ICT has the potential solve many complex problems such as, an early diagnosis of symptoms can save a person’s life. Rural health kiosks can transmit symptoms of a sick person to centrally located hospital and provide a cure via the same medium to the person. A patient in emergency can be given prior importance and shorter waiting times when innovative communication technologies are deployed. The hospitals investing in the state of the art communication systems can increase the satisfaction level of both, the patient and staff and deliver quality service at affordable cost. The ICT also helps in transfer of information overseas, providing assistance through teleconferences, effective use of robots in certain surgeries, etc..

**Scope of applications of ICTs in selected service sector –**

**Information Technology (IT) and Information Technology enabled Services (ITeS):**

The ITeS market, which came into existence with the entry of the MNCs, expanded its base through Indian IT software and services companies, especially the ones with a strong base of outsourcing. A number of leading industrial groups in the country have set up ITeS-BPO facilities with a view to participate in this emerging opportunity. India has remained one of the most favorable offshore destinations for BPO-ITeS activities.

Global companies have started to outsource their requirements to India to capitalize on the cost advantage due to the abundance of cheap labour. The huge middle class can be effectively tapped by the marketers if they are ICT enabled. The industry plays a critical role in the ICT revolution by increasing the rate of diffusion and reinforcing interactive learning amongst the people. The growth of IT sector has enabled the developing economies to catch up with new technologies and services of developed economies through international electronic networking.

The database required to be managed on a real time basis by the organization is very substantial and in fact cumbersome if done manually. The margins being low, a reduction in costs through long term technological upgradation and networking is very critical for their long term survival. So in order to encash the opportunity and establish brand, the organizations need to make effective use of ICTs, which in turn will contribute to growth of service sector and economic development of the country.
Banking and Insurance – Banking and insurance contribute to the country’s development through the financial support provided to all the private and public sectors. This help the public through mobilizing their savings and also guiding the individuals to make investments. Banks and insurance agents have diversified into Mutual funds, retail banking, merchant banking and so on. This has in turn led to computerization of information related to all the banking transaction such as e-banking in order to save time and to have effective utilization of available information.

Bank and insurance companies with the help of ICTs have restructured themselves to be flexible, time consuming and customer focused. Earlier customers had to go through long waiting time are being offered ‘anytime’, ‘anywhere’ kind of customized solutions due to the ICT revolution. Net banking enables customers to draw / transfer funds, pay for public utility services, trade on-line, download balance statements etc. easily, saving on time and cost for both the customers and the bankers. This in turn has made the entire banking transaction as paperless and customer friendly.

ICTs has had a positive impact on stock markets going on-line and real time and thus eliminating cumbersome procedures. As speed is one of the parameters of competitive strength, effective use of ICTs in this sector could enhance the competitive strength of the country by reducing the lead-time in collection and investment of funds.

Scope of ICT in business communication:

Technology has altered modern life in many ways, especially in the workplace. The invention of computers, the miniaturization of electronics and the development of wireless communication have all altered the business world. Business communication, in particular, has seen some of the greatest advancements due to technological developments.

i. Cellular Phone - One of the biggest advancements in communication has been the development of the cellular phone. It has changed the work culture and brought efficiency in the work. The development of smartphones has led to audio visual communication as well as access to records and files of the office via internet. Thus, increasing productivity and extending the workday.
ii. **Teleconferencing** – The development of network technologies led to the emergence of high-speed data connections which allowed the use of teleconferencing, virtual meetings held over audio and video links. Teleconferencing can save substantial amounts of money otherwise spent on travel by connecting important employees in far-flung branches together to share ideas and information. The use of virtual whiteboards, communal data-sharing platforms where remote users can interact as if around the same table, further increase the possibilities of the virtual workplace.

iii. **Image Scanning** - Document and image scanners allow workers to convert paperwork, plans, diagrams and photos into electronic files quickly for storage and transmission. Instead of relying on hand delivery of important documents across town or across the country, employees can scan and send these files in a matter of seconds across the Internet. An architectural firm could, for instance, scan updates to a plan, transmit it to the client, receive changes and make alterations all before a messenger would have been able to make the first run across town.

iv. **Radio frequency identification (RFID)** - The development of radio frequency identification has substantially changed the field of business logistics. RFID tags are small chips that respond to radio waves with encoded information, allowing companies to tag and track items and materials. When an employee activates a scanning device, all RFID tags within range will respond with their coded information, allowing for quick updates of warehouse inventories and real-time tracking of shipments as they pass through the supply chain. Thus, any packet on logistic can be traced easily (http://smallbusiness.chron.com/role-technology-business-communication-55139.html).

**The Potential Uses of ICTs:**

1. **Facilitating public and private sector activities areas such as in:**

   1.1 **Public Administration** - Public administration is a key aspect of civil society and includes a range of services to citizens and industry. It provides various functions that enhance the social, economic and political developments of the country. Most importantly, it provides public information that is useful to the community at large. ICT can facilitate the public administration in bringing transparency and efficiency in the administrative work. Online working system will leave no scope for lethargy and dishonesty in work.
1.2 Urban and Rural Development - The urban planners can use the ICT tools for projecting the future trends of the city and can develop several models and simulations to sort out the urban problems. The rural population can be largely benefitted with the application of ICT. The extension of ICT applications can help them know government schemes and policies, give them better medical aid, provide unman resource development etc. The establishment of telecentres in rural areas can facilitate economic empowerment. Mobile telephony can also help rural entrepreneurs in keeping in touch with their market outside their communities.

1.3 Transport - ICT can be used to improve road, air and rail transportation. ICT applications are noticeable in the air transport control, monitoring of freight and the day-to-day transport system. For example, the development of smart cards helps facilitate the smooth operations of the transport system. These operations include payment for parking metres, identification of authorised parking space occupants.

2. Improving the quality of life for citizens in:

2.1 Health - ICT applications are becoming valuable resources in the medical field. They support efficient exchange of information between health professionals, enable transfer of patient records between sites, telemedicine and thus improve clinical effectiveness, continuity, and quality of care by health professionals.

2.2 Special Needs (for the Physically Challenged) - For many people with physical disabilities, ICTs can be extremely useful in providing access to communication, education and open up opportunities for them. The use of Braille keyboards and printers can help alleviate some common literacy and numeracy problems for visually impaired or blind people. Most telecommunications infrastructures are now being designed with the capabilities of meeting the special needs of the physically challenged. For instance, the Short Message Service (SMS) can be used to send and receive messages by the hearing impaired, the voice activated dialling service can be used by visually impaired.

2.3 Education - The education sector is arguably one major area that ICTs are playing remarkable a role. These technologies help in facilitating learning and exchange of educational materials. ICTs are helping library professionals store and manage academic information. Libraries have migrated from the traditional Dewey cataloguing system to an online system, which is a web-based cataloguing and search application. The online learning system is another web-based application that is revolutionising the learning platform of
education. This system compliments the traditional face-to-face teaching and learning format. In the on-line system, students can access class notes, submit assignment and also join a discussion group with other learners.

2.4 Environment - ICT applications can help in collecting data about environmental issues. They allow access to information and provide support system to manage and monitor environmental issues. For example, the geographical information focuses on the collection, storage, analysis, display and application of geographic data. Analysis and future projection of the environment can be done effectively with the help of ICT tools.

2.5 Agriculture - At the micro level, ICTs applications can be used to impart information directly to farmers and the farming community. There are expert system designed to handle agricultural issues such as water utilisation and management, pest control, harvest management and so forth.

2.6 Sharing Knowledge and Improving Access to Information - This has been one of the most popular use of the ICT. Various communication technologies, ranging from broadcasting to telecommunications and to the internet are playing effective roles in the acquisition and sharing of information. The concepts of the 'information revolution' and 'information society' are driven by enormous advancements in ICTs and their application. The Internet for example, has provided platforms for sharing information in applications such as the E-Mail and The World Wide Web.

3. Facilitating Activities in the Business Sector such as:

3.1 Manufacturing - ICTs applications are linking the process chains in manufacturing as opposed to improving or facilitating single steps in the production lines. The mass production of goods and services is gradually giving way to a network-based production and manufacturing system. There has been a shift from the old production system to a new mode which is facilitated by information and communication technology. While the old production and manufacturing system is energy intensive, standardized and departmentalized the new manufacturing system facilitated by ICT is information-intensive, customized, networked and integrated. Furthermore, the design stage of product manufacturing benefits enormously from the use of ICTs. For instance, the use of Computer-aided-design (CAD) has improved the design stages of machine tools.
3.2 **Electronic Commerce** - Electronic commerce (e-commerce) is the use of internet or telecommunications to carry out business of any type. Common examples of e-commerce are online shopping, online banking, online stock trading etc. One of the advantages of e-commerce is the reduction of transaction costs. Electronic transaction of business activities has 'redefined' the concepts of 'market', 'seller' and 'buyers', as they all converge now on the electronic space. Billions of dollars worth of transactions are completed on the Internet. This development has warranted national government involvement in regulating e-commerce activities.

3.3 **Travel and Tourism** - The travel and tourism industry has been heavily affected by ICT applications. It is used to provide multimedia information about destination to prospective travellers. It also affects auxiliary industries, such as the transport sector, which plays a major role in the tourism industry. With the aid of ICT applications, prospective travellers can view a destination, book accommodation, book the flight and other forms of transport and pay for all these without leaving their homes. ICTs in this industry consist of various components that include computerised reservation systems, teleconferencing, video, video brochures, management information systems, airline electronic information systems, electronic funds transfer, digital telephone networks, smart cards, mobile communication, e-mail, and internet. These various communication technologies are being used in all sectors travel and tourism industry and related sectors.

**Impact of ICT :**

The impact of information technology can be visualized at local, national, regional and global level both in positive and negative form. The followings are the major affected areas due to information technology.

1. Administration
2. Academics
3. Society
4. Business
5. Medical
### Table 2.1: Impact of ICT on society

<table>
<thead>
<tr>
<th>Access to information</th>
<th><strong>Positive Impact</strong></th>
<th><strong>Negative Impact</strong></th>
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<tbody>
<tr>
<td></td>
<td>huge increase in access to information and services due to capability of bandwidth, broadband and connection speed on the internet</td>
<td>digital divide between those who can access information and those who cannot</td>
</tr>
<tr>
<td></td>
<td>saves time and is inexpensive</td>
<td>reducing education and understanding due to the vast amount of misleading and incorrect information.</td>
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<tr>
<td></td>
<td>better and cheaper communications like VoIP phone and Instant Messaging</td>
<td>tendency to choose online communication rather than having real time conversations.</td>
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<td></td>
<td>new opportunities for leisure and entertainment, contacts, relationships with people around the world</td>
<td>rise of individualistic and introvert people</td>
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<tr>
<td></td>
<td>ability to obtain goods and services from a wider range of suppliers.</td>
<td>rise of theft, hacking, online gambling, hypersexualisation of youth and pornification of sexual relations</td>
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<tr>
<td></td>
<td>higher standard of living</td>
<td>lack of privacy</td>
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<tr>
<td></td>
<td>hope for the poor</td>
<td></td>
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<td></td>
<td>availability of public services</td>
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<tr>
<th>Employment</th>
<th><strong>Positive Impact</strong></th>
<th><strong>Negative Impact</strong></th>
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<tbody>
<tr>
<td></td>
<td>created new segment of employment</td>
<td>reduced employment</td>
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<tr>
<td></td>
<td>emergence of a new class of IT literate people</td>
<td>machines have replaced several categories of job employments</td>
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<tr>
<th>New tools, new opportunities</th>
<th><strong>Positive Impact</strong></th>
<th><strong>Negative Impact</strong></th>
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<tbody>
<tr>
<td></td>
<td>development of new tools which have enabled people to produce results that would previously required a specialist</td>
<td>use of new tools for unethical work</td>
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<td></td>
<td>tools for people to overcome disabilities. e.g. screen magnification or screen reading software enables partially sighted or blind people to work with ordinary text rather than Braille.</td>
<td>rumours and gossips spread fast through the use of ICT</td>
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<td></td>
<td>enhanced security through tools</td>
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<td>Table 2.2: Impact of ICT on business</td>
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<table>
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<tr>
<th>Positive Impact</th>
<th>Negative Impact</th>
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| **Communication** | • cost saving due to technology e.g. VoIP instead of normal telephone, email / messaging instead of post, video conferencing instead of traveling to meetings  
• e-commerce web sites instead of sales catalogues.  
• access to larger, even worldwide, markets.  
• compatible banking system to process payments, e.g. credit / debit card, Pay-Pal, bank transfer facility.  
• better customer relations, an improved supply chain for goods and services, faster development of new products to meet a new opportunity, etc.  
• impetus to online trading and new avenues like e-governance | • hardware and software is expensive, both to purchase and to maintain.  
• challenge of keeping up with ever-changing technology. |
| **Information management** | • simplification of data mining activities  
• improved inventory management, stock control, resulting in less wastage, better cash flow, etc.  
• through various ERP tools managers are better informed and have more reliable and up-to-date information for decisions making | • increased competition among companies  
• difficult for startups companies to survive  
• expense over the new branch of knowledge management |
| **Security** | • enhanced security of data and money from unauthorized people | • cost of security is high  
• any breach of security may |
enhanced commercial secrecy.  
enables physical security systems such as fingerprint, iris or facial recognition.

| Economic          | Suppliers and customers available around the clock through different parts of the world  |
|                  | Customer oriented e-commerce model  |
|                  | Increased business opportunities  |
|                  | cost reduction  |
|                  | Paperless environment  |
|                  | business influenced by world economy  |
|                  | Shopping online leaves shoppers at risk of online credit and theft.  |
|                  | online retail models are precipitating closure of high street shops  |

| Benefit to organizations | global reach  |
|                         | supply chain improvement  |
|                         | extended hours  |
|                         | customization  |
|                         | new business models  |
|                         | vendor’s specialization  |
|                         | rapid time to market  |
|                         | lower communication cost  |
|                         | effective procurement  |
|                         | improved customer relations  |
|                         | up-to-date company material  |
|                         | no city business permits and fees  |
|                         | Prone to various cyber crimes  |

| Benefit to customers | Ubiquity  |
|                      | More products and services  |
|                      | Cheaper products and services  |
|                      | Instant delivery  |
|                      | Information availability  |
|                      | Participation in auctions  |
|                      | Electronic communities  |
|                      | Prone to various cyber crimes  |
|                      | Difficult to make buying decision as touch and feel aspect is absent as in case of e-commerce  |

**Table 2.3: Impact of ICT on academics**

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<tr>
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<th>Positive Impact</th>
<th>Negative Impact</th>
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<tr>
<td>Students</td>
<td>Easy access of teaching materials from all over the</td>
<td>The cost involved cannot be met by poor students as well as some</td>
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Easy access to various educational hubs and scholars

Lack of face-to-face interaction and campus life

Students, and sometimes teachers, can get hooked on the technology aspect, rather than the subject content. Just because a topic can be taught via ICT, does not mean that it is taught most effectively via ICT. Large areas of the curriculum may not be benefitted. Trainers may need some technical training

the ability to perform ‘impossible’ experiments’ by using simulations, using ICT students get a wider range of resources and experience some extra motivation, wider resource range remains a positive factor Effective sharing of information Time saving

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the possibility for students to have individual learning programs within a topic, rather than everybody having to do the same thing at the same time at the same pace. More able students can be given more challenging work, less able students can access remedial lessons.

reducing levels of education and understanding due to the vast amount of incorrect and misleading information that is available causing moral and ethical problems due to the nature of some of the material available. ICT has caused lack of specialization and lack of development and reading because of its information overload.

Impact of ICT on administration

Better use of resources

Improved governance through e-governance

Efficiency in the operation of delivering government services

Medical

Table 2.4 : Impact on Medical

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- Efficiency in delivering medical help
- Medical facilities can be extended to rural communities
- With ICT people can adopt more luxurious lifestyle and can lead to physical problems e.g. obesity, eye problem etc.

**Environmental Impact of Information and Communication Technology**

In the manufacturing of ICT based products there is an extensive use of certain chemical compounds. Some of these elements like cadmium (Cd), lead (Pb), Arsenic (As) etc. are present in the desktop computers and monitors. There is chance of exposure to these toxic compounds after the disposal of the ICT devices. These exposures may result in problem of health, disturbance in ecological balance, damage to sea life etc. Another possible source of exposure is the re-use or recycling of these devices, or of part of the devices. Strict regulations are in place to recycle materials which may contain toxic elements but they are not applied in developing economies. The major environmental impacts of ICT can be categorized into three broad categories as shown in figure 2.4.

**Figure 2.4: Environmental Impact of ICT**
Direct impacts of ICTs on the environment (or “first-order effects”) refers to positive and negative impacts due to the physical existence of ICT products (goods and services) and related processes. The sources of the direct environmental impacts of ICT products are ICT producers (ICT manufacturing and services firms, including intermediate goods production) and final consumers and users of ICTs. ICT producers affect the natural environment during both the production of ICT hardware, components and ICT services and through their operations (e.g. operating infrastructures, offices, vehicle fleets). In addition, the design of ICT products determines how they affect the environment beyond company boundaries. Energy efficient components, for example, can reduce the energy used by ICT equipment. Modular ICT equipment and reduced use of chemicals in production can improve re-use and recyclability.

Enabling impacts of ICTs (or “second-order effects”) arise from ICT applications that reduce environmental impacts across economic and social activities. ICTs affect how other products are designed, produced, consumed, used and disposed of. This makes production and consumption more resource efficient. Potential negative effects need to be factored in when assessing “net” environmental impacts, such as greater use of energy by ICT-enabled systems compared to conventional systems. ICT products can affect the environmental footprint of other products and activities across the economy in four ways:

i. Optimisation: ICTs can reduce another product’s environmental impact. Examples include embedded systems in cars for fuel-efficient driving, “smart” electricity distribution networks to reduce transmission and distribution losses, and intelligent heating and lighting systems in buildings which increase their energy efficiency.

ii. Dematerialisation and substitution: Advances in ICTs and other technologies facilitate the replacement of physical products and processes by digital products and processes. For example digital music may replace physical music media and teleconferences may replace business travel.

iii. Induction effects can occur if ICT products help to increase demand for other products, e.g. efficient printers may stimulate demand for paper.
iv. **Degradation** can occur if ICT devices embedded in non-ICT products create difficulties for local waste management processes. Car tyres, bottles and cardboard equipped with “smart” tags, for example, often require specific recycling procedures.

**Systemic impacts** of ICTs and their application on the environment (or “third-order effects”) are those involving behavioural change and other non-technological factors. Systemic impacts include the intended and unintended consequences of wide application of green ICTs. Positive environmental outcomes of green ICT applications largely depend on wide end-user acceptance. Therefore, systemic impacts also include the adjustments to individual lifestyles that are necessary to make sensible use of ICTs for the environment. ICT applications can have systemic impacts on economies and societies in one or more of the following ways:

i. **Providing and disclosing information:** ICTs and the Internet help bridge information gaps across industry sectors. They also facilitate monitoring, measuring and reporting changes to the natural environment. Access to and display of data inform decisions by households (e.g. “smart” meters), businesses (e.g. choice of suppliers, verifying “green” claims), and governments (e.g. allocation of emission allowances, territorial development policies). Sensor-based networks that collect information and software-based interpretation of data can be used to adapt lifestyles, production and commerce in OECD and developing countries to the impacts of climate change.

ii. **Enabling dynamic pricing and fostering price sensitivity:** ICT applications form the basis of dynamic or adaptive pricing systems, e.g. for the provision of electricity or the trade of agricultural goods. Through the use of ICTs, producers can provide immediate price signals about supply levels to final consumers. In areas of high price elasticity, optimization of demand can be expected. Electricity customers, for example, can choose to turn off non-critical devices when cheap (and renewable) energy is scarce and turn them on again when it is more plentiful. This is an important part of green growth strategies that aim to use market principles to encourage sustainable behaviour.

iii. **Fostering technology adoption:** Technological progress provokes behavioral changes. The “evolution” from desktop PCs to laptops to notebooks is one example of changing consumer preferences. Digital music, e-mail communications and teleconferencing technologies are affecting the ways in which their physical counterparts are produced and
consumed, i.e. recorded music, written letters and physical business travel. As new consumption patterns emerge, e.g. in the consumption of music on digital media, these trends result in direct impacts (energy use of servers to store and provide digital music) and enabling impacts (reduction in the use of physical music media).

iv. **Triggering rebound effects**: Rebound effects refer to the phenomenon that higher efficiencies at the micro level (e.g. a product) do not necessarily translate into equivalent savings at the macro level (e.g. economy-wide). This means, for example, that the nationwide application of a 30% more efficient technology does not necessarily translate into energy savings of 30% in the application area. Analysis, mostly in the area of consumer products, shows that “rebound effects” at the macro level partly offset efficiency gains at the micro level, but the exact causes, magnitudes and long-term trends are not yet clear. In areas such as personal car transport or household heating, higher efficiency (or lower price) of a product can increase demand in ways that offset up to one-third of the energy savings. Relatively little empirical analysis has focused on ICT-enabled rebound effects. As an example of the interaction between the direct and rebound impacts of ICTs, higher energy efficiencies of semiconductor products must be weighed against the overall growth of the use of ICT products (Report -Organisation for economic cooperation and development (OECD), Greener and Smarter ICTs, the Environment and Climate Change, September 2010).

**Energy consumption** - The energy consumption associated with ICT devices is also an important issue to consider. For the majority of ICT devices, a greater proportion of the energy is necessary for manufacturing the device than for using the device itself.

**Impact of ICT on social structure** –

It is now observed that what we call the information revolution has in fact been underway for more than thirty years. The declining share of populations in the industrialized world engaged in manufacturing and the rising ‘information content’ of total economic output are prime indicator of the impact of ICT. As a consequence of this rising information content, the return to education are increasing, widening the income and social gaps between more-educated and less educated workers. It is found that these higher levels of education might create new social and
political dynamics. The work has become more knowledge oriented and less physical. On gender
differentiation, these emergences are responsible for creation many new opportunities for
women. We are now finding more women in ICT profession and the working style will certainly
going to change the family structure also.

The information age also induced changes in organizational structures and
institutionalizations of society. Implementation of ICT based business services demands a
compatible organizational structure. The rationale for centralized, hierarchial structures in firms,
in governmental agencies, and in other institutions is passing. When communication was slow,
costly, or cumbersome, vertical structures were efficient because it minimized the latency in
necessary flow of information and the associated transaction costs. Much cheaper and easier
communication is giving rise to flatter structures characterized by much more horizontal
communication. Moreover, hierarchies have a way of slowing and distorting information flows.
The direct exchange of information through a flat, networked structure that are facilitated by
advancing ICT today provides an important efficiency advantage for organizations that can
create the right structures. Flatter organizational structures place a higher value on social
networks and on informal communication than did older hierarchical structures.

Economic and organizational changes which are driven by information revolution can
have important consequences. There are major changes in traditional economy. A ‘new
economy’ as ‘Digital Economy’ is emerging where financial institutions will be operating in
digital and wired environment. On social segment, the changes in the roles of financial
institutions had led to changes in family structures by reducing cohesion within the family
members. It has been observed that the information revolution has weekend social connections in
western and industrialized countries.

There is another interpretation of these changes. Some claims that the changes are not in
the strength of social connections, but on their radius. That is, the information revolution has
allowed individuals to form social connections with like – minded persons who are not part of
the same geographically local community. We are now free from the restrictions imposed by
geography and each of us can now have multiple identities. These identities are arising from the
different ‘communities’ with which we are able to interact.
Advances in ICT have contributed to the processes widely recognized as globalization. International competition requires national governments to push their citizens to ever higher levels of human capital, but the ultimate social consequences of these developments remain to be seen. In the political realm, the ICT revolution seems to have provided a boost for democracy through more social stratification. Easier communications have also increased the effectiveness of non-governmental organizations (NGOs). With improved access to information, NGOs are more independent of governments.

Because of gaps in socio-economic development, education, income levels and because of language and geographic barriers, not all countries and individuals have equal access to the new advances in ICT. In its 1998 report, the World Bank points out that poor countries and poor communities will fall behind more rapidly than ever before with the rapid development of ICT. As we are enthusiastic about the information superhighway, there are villages and slums without telephones, electricity, or safe water and there are primary schools without pencils, papers or books.

**Impact on Business operation –**

Technology has rapidly become a workplace fixture and is increasingly being woven into our lives and lifestyles, providing new options for communication, personal productivity, community interaction, expanding career and business opportunities. The capabilities of personal computing and the internet are becoming remarkable tools to help people with disabilities overcome many of the challenges they face. Implementing accessible technology can amplify and accelerate these opportunities and serve as an equalizer.

During last two decades the share of high technology goods and services in international trade has doubled as compared to previous. However, the trading of high technology goods and services is highly concentrated in the industrialized countries. Knowledge – based products now make up more than half of the GDP of the world’s major countries. It means the operational areas of various business organizations are changing. The globalization of trade, finance and information flows is intensifying competition. Ability to gain access to the information superhighway is the key to success in the world market. But there are the paradoxes also. As ICT spreads into every aspect of life, those who have access to it and knowledge have more sources
of information and ways to gain support. In contrast, people in developing countries may not even have access to information that is crucial to their basic survival. It may lead to critical social consequences also. As ICT becomes a dominant communication channel, poor people in developing countries will be further deprived of opportunities to express opinions and participate in social development. Social exclusion have become a very real possibility for the already marginalized people in developing countries.

Development in ICT is also further marginalizing the indigenous knowledge of developing countries. Internet is a platform for all types of information. However, as the internet is dominated by commercial information, information on indigenous issues is minimal.

ICT development and globalization are closely related. Recently we have witnessed some cases of mergers between ICT and media companies. The trend towards a high concentration of ICT and media ownership and control is worrisome as it introduces the question of whether cultural diversity will eventually diminish. Will ICT and knowledge become even more uniform? Will the indigenous knowledge of developing countries be further ignored or forgotten? These are the issues which are of major concern at present. Developed countries not only steer the development of ICT, but also own a large part of technology through patent and intellectual property legislation. Data shows that over 60% of all internationally recognized patents are held by multinational companies in Europe and the US (Oxfam International,1999) and that 80% of the patents in developing countries are owned by citizens of developed countries (UNDP,1999). Currently, rules and regulations regarding intellectual property in trade, stipulated by the World Trade Organization (WTO), serve as barriers to developing countries in applying ICT. The cost for developing countries to gain access to ICT is higher than for developed countries. International patent rules and regulations can limit indigenous people’s right to use and own indigenous knowledge. Rich companies in Europe, the US and Japan has patented information on traditional resources in developing countries. By doing this the knowledge, technology and resources that could have once been freely used by the public have now become the properties of small group.

According to a report of the World Bank (1988), the ratio of research and development expenditures in high income countries to that of low income countries is 218:1. Developing
countries are unable to participate in this capital and knowledge intensive industry. This will result in a form of knowledge gap between developed and developing countries. This is due to the fact that for poor countries it is not possible to set aside priority of social welfare tasks and involve in ICT development. The benefits of ICT investment may take some time to be realized. On being surveyed among 100 business persons in the urban areas of Varanasi a question was asked that were they aware of the recent development of the ICT in the field of business. Around 79 percent of the respondents gave the answer positively (figure 2.5). This shows that the impact of ICT is much visible in the business field.

**Figure 2.5: ICT awareness among business person**

![ICT Awareness](image)

**Information Communication in Modern Form:**

The convergence of money, commerce and ICT is laying the foundation for global consumer marketplace. A computer system is used to process the data and generate the information. The generated information is not useful in itself and it must be delivered to the information workers, who are expecting this. For this purpose the information must be transmitted from one location to another location. The complete process is called as data communication. Data communication is the transmission of coded information from one location (source) to other location (destination) by means of coding of information in form of electrical signals through electromagnetic or wireless devices and communication media. The
communication media could be a physical media, optical media or wireless media. The device could be microphone, computer, speaker, modem etc..

The inventions in data communication are major drivers for information revolution, there are tremendous changes in the mode of communication. The information systems in modern business management are based primarily on the networking of computer system and other devices. There are various forms of communication which are contributing towards the development of global markets in the form of information revolution.

**Radio Frequency and satellite communication:** Radio frequency communication is based on the principle of transmission of information in form of electromagnetic waves as radio frequency radiations. Signals at 100 MHz is labeled as very high frequency (VHF) and at 400 MHz it is labeled as Ultra High Frequencies (UHF). Above to that in electromagnetic spectrum is called the microwave region. This is identified as shorter wavelength and high frequency. Radio frequency based wireless communication has been in existence over 80 years. After World War II there was remarkable development in the field of wireless communication. Various applications are generated on radio frequency communication, such as Amplitude Moderation (AM), Frequency Modulation (FM) and Television transmission. Satellite transmission has fueled innovations in the field of radio frequency communication and whole world could be networked on the basis of wireless and satellite communication. Previously high frequency radio signals had been restricted to line-of-sight distance on earth. This was called as terrestrial transmission. The invention of geosynchronous satellite removed the limitations of terrestrial transmission and now it is possible to communicate with any part of the world regardless the shape of the earth. Communication satellites provide the first long distance broad band communication system. Without this system it was not possible to communicate through terrestrial communication throughout the earth due to its shape and various other reasons. For example the shape of earth and existence of mountains and seas etc. is major barrier for line-of-sight transmission. On other hand the signals get attuned during transmission after some distance. In satellite communication the signals are beamed towards reflector from any earth station followed by amplified transmission to the receiving stations of the earth. Normally all communication satellites are placed and orbiting around the earth in geosynchronous orbit and
remain stationary over a specific location with respect to a position on earth. At present various satellites are orbiting in different orbits around the earth.

**Cellular communication system:** A cellular communication system provides a wireless connection to the public telephone network for any user location within the radio frequency range of the system. The term mobile has traditionally been used to classify a device or terminal that can be moved during communication. Cellular system accommodates a large number of mobile units over a large within a limited frequency spectrum. Each mobile device communicates via radio waves with one or more base stations. A call from a user can be transferred from one base station to another during the call. This process of transferring is called handoff.

The cell phone concept originated in 1947; but its commercialization started in 1979 in USA. It was referred as Advanced Mobile Phone System (AMPS) at that time and it was an analog signal based system. APS were in existence in USA till 1997 and in some part it is still prevalent. The next system was developed as GSM on the name of committee which designed this system Group Special Mobile. It is now named as Global System for Mobile Communication. It is digital based system, i.e. all data and voice are transmitted in digital packets. The operating frequencies for both systems are different so that the simultaneous operations could be ensured.

The transmission data in AMPS is based on Frequency Division Multiple Access (FDMA). In this case each user is assigned independent frequency which is unique within the transmission spectrum, called as channel. In GSM Time Division Multiple Access (TDMA) is used. In this case the transmission spectrum is not divided into channel for each user rather a user can use all spectrum but only for a fraction of time during which complete information could be transmitted. After that another user occupies the spectrum to be transmitted. After that another user occupies the spectrum to transmit the information. The process of packet building for digital data take place during the gap period and again it is transmitted.

There is a third approach also for cellular phone technology as Code Division Multiple Access (CDMA). In this case the user is not separated in frequency and time of utilization of
spectrum. Here each user is assigned unique digital code which encodes the voice data. The receiver uses the same code for decoding of the encoded data.

In FDMA technology the number of simultaneous users depend upon the total numbers of channels available, while in TDMA it depends upon the same slots. In CDMA the maximum number of simultaneous users depends on the tolerable interference in spectrum which is greater than FDMA or TDMA. Only disadvantage of CDMA is system complexities. A new development in cellular phone services is Personal Communication Services(PCS).

**Fiber Optics Transmission**- There are two basic approaches for transmission of signals. The first one is by using some material medium as wires or optical fiber etc. while other one is through wireless medium. Wired transmission is a versatile mode of data transmission which controls the guided and unguided movements of electromagnetic waves. Fiber optic transmission is one of the most advanced form of wired mode of transmission. It is based on the transmission of coded optical signals with less attenuation. Attenuation is phenomenon in the transmission of electromagnetic waves where the amplitude of the electromagnetic wave decreases with distance. A fiber optics cable is a coaxial collection of glass and plastic material designed in form of thick hair like wires. It is made up of optical material for core which is surrounded by another optical material called cladding. These two materials will have different refractive index. Refractive index is a term which measures the ratio of velocity of light in the optical medium with reference to velocity of light in vaccum.

Fiber optics transmission is based on total internal reflection. In this phenomena when light ray is transmitted from denser medium to thinner medium then at certain angle it completely reflects back into the same denser medium. The particular angle is called critical angle. The benefits of optical fiber transmission includes:

- Total confinement of optical signal
- No electromagnetic or atmospheric interference
- High bandwidth

**Wireless Application Protocol (WAP)** – The wireless industry came up with the idea of WAP as a standard for application communication protocol for and used to access services and
information. The point of this standard was to show internet contents on wireless clients like mobile phones. WAP was published by the WAP Forum, founded in 1997 by Ericsson, Motorola, Nokia and Unwired Planet. Forum members now represent over 90% of the global handset market, as well as leading infrastructure providers, software developers and other organizations. The WAP protocol is the leading standard for information services on wireless terminals like digital mobile phones.

To fit into a small wireless terminal, WAP uses a micro browser. A micro browser is a small piece of software that makes minimal demands on hardware, memory and CPU. It can display information written in a restricted mark up language called Wireless Markup Language (WML). It enables the creating of web applications for mobile devices. The Micro Browser can also interpret a reduced version of Java Script called WML script. WML uses WML script to run simple code on client. WML script is light Java Script language. However WML script are not embedded in the WML pages. A WML page only contains references to script URLs.

The WAP standard is based on internet standards (HTML, XML and TCP/IP). It consists of a WML language specification, a WML script specification and a wireless telephony application interface (WTAI) specification. WML scripts need to be compiled into byte code on a server before they can run in a WAP browser.

**Global Positioning System** - It is a combination of radio and satellite based communication system. Under this technology the receiver position anywhere in the world could be determined and identified. The global position is determined in term of latitude, longitude and elevation over sea. After determination of position of receiver, the processor can convert the location into meaningful visual information from to the user. GPS is based on the principle of triangulation. With GPS we can identify the position in 3 dimensional forms by set of GPS satellites which are distributed fairly evenly in orbits above the earth. The complete GPS systems consists of three components :

- Satellite
- Receiver
- System control center
GPS can be used for various purpose like air and marine navigation, outdoor activities, emergencies, surveying etc..

Contemporary Applications of Information Technology:

Information technology is playing crucial role in contemporary society. It has transformed whole world into global village with a global economy which is increasingly dependant on the creative management and distribution of information. Globalization of world economies has greatly enhanced the value of information to business organizations and has offered new business opportunities. Today IT provides the communication and analytical power that organization need for conducting trade and managing business at global level with much ease. To coordinate their world wide network of suppliers, distributors and customers, organization have developed global information system that can track orders, deliveries and payments round the clock. This has been possible because of development of IT in its present form. While IT can be used in many fields – business, education, science and technology, entertainment, health, etc., its contemporary applications in business field are quite relevant. These applications are in the following areas:

Electronic mail – Electronic mail is a fast and efficient method to exchange messages between two or more persons. E-mail can be defined as the exchange of massages through a computer network. The architecture of email defines the subsystems of email and how they are organized. There are normally two subsystems in e-mail – user agents and message transfer agents. User agents allows the user to send or read email. These are local programs that provide a command based, menu based or graphical method for interacting with the email system. Message transfer agents move the messages from the source to the destination. These agents are typically system daemons that run the background and move e-mail through the system. Typically, email supports five basic functions – composition, transfer, reporting, displaying and disposition.

Electronic commerce – Electronic commerce has emerged as an important application of information technology in the contemporary society. This involves performing commercial operations electronically. In a usual commercial operation, buyers and sellers come in contract
with each other either physically or through other means of communication and rest of the buying / selling procedure is performed in physical sense. However, in e-commerce the entire process, including the contact between buyers and sellers, is completed through the use of information technology. E-commerce applications can be broadly classified into the following categories based on the extent, scope and functionality of an e-commerce model:

1. Business to business (B2B)
2. Business to consumer (B2C)
3. Business to government (B2G)
4. Consumer to administration (C2A)

**On-line information services** – Our contemporary society has become information society in which people try to have as much information as possible while sitting at home. This has become possible because of the provision of online information services. These on-line information services may provide information of any kind ranging from time schedule of arrival / departure of train / aeroplane to vast treasure of research work, entertainment or even how to hack a website. Presently the world is thinking to create information superhighway which is high speed digital transmission capable of providing connectivity of homes and workplaces. This superhighway is capable of delivering text, graphics, video and audio simultaneously. The present internet can be termed as information highway. The technology of on-line information services consists of two parts – a client and a server. There are three ways in which information can be found on web – searching, browsing and surfing.

**Multimedia** – Multimedia is a form of communication that combines two or more types of media together, such as texts, graphics, sound, still video, full motion video or animation into a computer based application. By pressing a button on a computer, a user can call up a text, another button may bring up a related video images and so on. Multimedia systems combine the elements of today’s microcomputers with two additional elements – audio and video. It is powerful media to provide effective interaction between the users and information. Interactive multimedia is finding applications in geographical information system, business and corporate presentation, education and training (Yadav, 2005).
**Education** – Information and communication technology has proved to be extremely useful for education and research. Few years back people used to collect the relevant information from library journals and books. A lot of time was wasted to find in finding the relevant information source. With the popularity of world wide web and easy accessibility to the internet, it now takes a few seconds to find any desired information. ICT is considered as the convergence of several fields of science, technology and communication. In several schools / institutions, computers are being used as teaching aids. It is now very common to keep important lectures and presentation in digital form. In colleges and universities, the lecture series of various professors are recorded and may be referred later on. Virtual classrooms and teaching are gaining momentum day to day. Several softwares have been developed which explain the concept of mathematics, logical reasoning, basic science etc..

**Banking and Financial Institutions** – Information and communication technology has helped the banking and financial institutions to automate their business process and minimize the transactional delays. In the banking and financial institutions, the performance is measured in terms of processing speed and customer satisfaction. With the application of ICT, it has become possible to clear the recurring dues like payment for electricity, telephone bill, shopping bill by instructing the bank for payment from customer account. Telebanking is a good example of this. After the introduction of computers in bank and internet connectivity, e-banking and online transfers from one account to another has also become possible. Authentication of credit card, debit card and other electronic payment instrument by the bank has also facilitated shopping, purchasing and minimized the transactional delays. With the introduction of ATM, it has become possible for customers to withdraw cash from bank round the hour.

**Weather forecasting** – ICT applications supported with a cluster of satellites are giving a concrete information regarding weather.

**REFERENCES :**


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