INFORMATION AND COMMUNICATION TECHNOLOGY

- SUMATHI P
- SELVANAYAKI S
- RAJALAKSHMI R

ABSTRACT

Information and communication technology(ICT) is an extensional term for information technology(IT) that stresses the role of unified communications and the integration of telecommunications and computers ,as well as necessary enterprise software, middleware, storage, and audiovisual systems, that enable users to access, stores, transmit and manipulate information. It is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives to merge the telephone network with the computer network with the computer network system using a single unified system of cabling , single distribution, and management.

1. INTRODUCTION

ICT is a broad subject and the concept are evolving. ICT is an umbrella term that includes any communication device, encompassing ratio, television, cell phones, computer and network hardware, satellite systems and so on, as well as the various services and appliance with them such as video conferencing and distance learning. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form. Theoretical differences between interpersonal-communication technology and mass-communication technologies have been identified by the philosopher Piyush mathur. Skill framework for the information age is one of many models for describing and managing competencies for ICT professionals for the 21st century.

1.1 COMPONENTS OF AN ICT SYSTEM

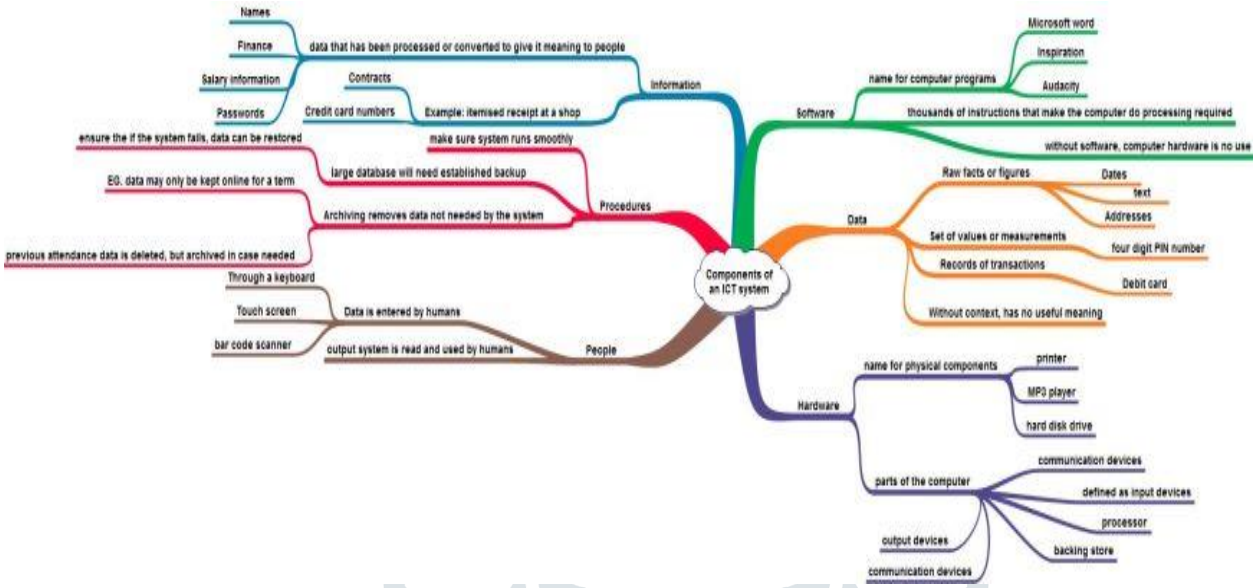
ICT encompasses both the internet-enabled sphere as well as the mobile one powered by wireless networks. It also includes antiquated technologies, such as landline telephones, radio and television broadcast-all of which are still widely used today alongside cutting-edge ICT pieces such as artificial intelligence and robotics.

ICT is sometimes used synonymously with IT, ICT is generally used to represent a broader, more comprehensive list of all components related to computer and digital technologies than IT.

There are six components of ICT system

- Data: raw facts and figures.
- Hardware: physical components.
- Software: the name given to computer programs.
- Information: data that is converted to give it a meaning.

- Procedures: a series of actions conducted in a certain order to make sure the system runs smoothly.
- People: data is entered by humans, for example a keyboard.



1.2 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 organization 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 information collected from various sources. The government departments, business organizations, scientists and academectian all

retrieve computer based information. The computer based information 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 and technical operational problem by introducing a much faster and more convenient methods based on its ability to access large and complex pool of data.

1.3 APPLICATIONS OF INFORMATION COMMUNICATION TECHNOLOGY

The information and Communication Technologies have brought many benefits of library and information systems and services. The application of computers in storage, retrieval and dissemination of information has brought new possibilities of automatic indexing and free text searching. Computerized acquisition helps processing purchase requests, receiving and accessioning documents, invoice processing and payment arrangement, order follow-up, online enquiries and preparation of reports, etc. In this process, computers enable libraries in making use of the same data available in different files without entering it again each time. Computerized catalogue is the most efficient tool in retrieving quickly.

Computerized serial control helps in creating a database of journals, processing new subscriptions, renewal of subscriptions, order placing and invoice processing, receiving and recording issues, claiming missing issues, bindery management, maintenance of list of periodicals, serials holdings, etc. Circulation procedure in a conventional system is very lengthy and consumes much of the staff time in repetitive works. The use of technological devices such as computers, barcode scanners, smart cards, etc in circulation helps in performing routine operations easily and quickly. It saves lot of 6 time for the staff as well as users. Computerized library can provide information quickly on various library management activities required by the management for budgetary control, preparation of account, maintenance of records, library statistics, etc. Once the computerization activities are well progressed, information retrieval and database management activities, including the Internet based information service can be strengthened. A wide variety of advantages can be derived by the appropriate use of ICT.

1.4 STORAGE TECHNOLOGY

For centuries paper has been considered as the appropriate medium for storing of information. But now the new technologies have succeeded in storing information on various media. Mass storage is necessary to meet the following needs:

• Providing large-volume digital storage for archival management;

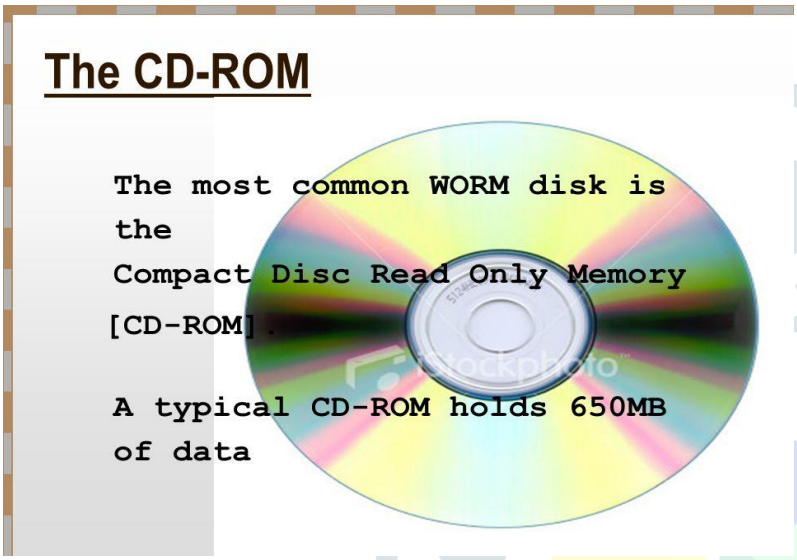
• Providing users with immediate access to the rapidly growing volume of data and information that is stored in digital information system and is likely to be distributed on optical media in the future; 10

• Providing users with access to multimedia information quickly and interactively through the integration of technologies; and

• Transferring large volumes data and/or files from one system to another.

1.4.1 COMPACT DISC-READ ONLY MEMORY (CD-ROM)

CD-ROM was developed in 1985. The growth of multimedia titles, games, entertainment and cheap availability of videodiscs, and the latest trend in software distribution through CDs made CD-ROM discs and drives more popular. The CDROM, as 12-cm and 1.2 mm thick disc can holding approximately 650-700 million characters (650-700 MB) equal to about 2, 70,000 pages of plain text or about 60,000 suitably compressed images. The advantages of CD-ROM are its huge storage capacity, durability, transportability light weight, easy and fast access to and noncorruptibility of stored information, immunity to magnetic fields and amenability for parallel searching by multiple users in a Local Area Network (LAN) or wide Area Network (WAN) environment. CD-ROMs can be used to store abstract databases, full-length articles, images, audio and software.

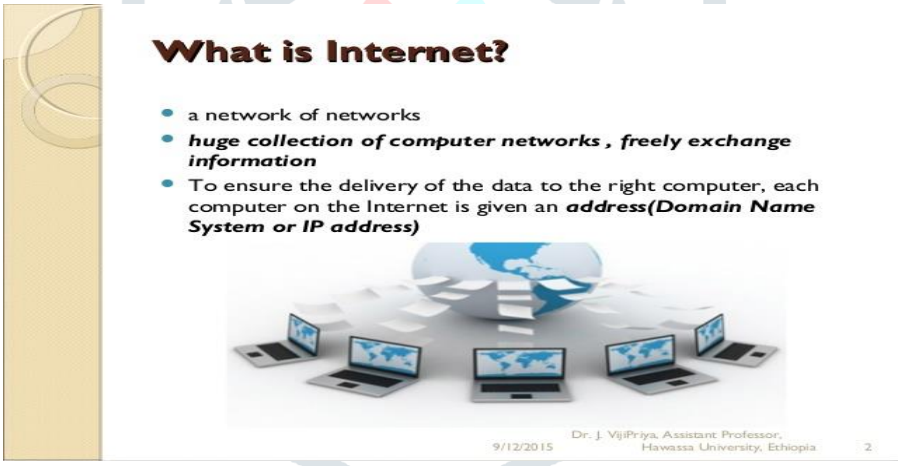


1.4.2 DIGITAL VIDEO DISK OR DIGITAL VERSATILE DISC (DVD)

Digital Video Disc or Digital Versatile Disc an optical storage medium looks like a CD but with high storage capacity. DVD facilitates greater data density by making the pits smaller and the spiral tighter, small recording pits, more closely spaced tracks, and backward compatibility with CD-ROM. For reading these tightly packed discs lasers that produce a shorter wavelength bean of light are required. DVD technology provides data capacity that is atleast 6 to 7 times greater than CD-ROM. Various form of DVDs are available, some of them are DVD-Video or DVD-V, DVD-ROM, DVD-R, DVD-RAM and DVD-RW. High storage capacity is achieved by compression technology and storing data on multi-layer sides. The DVDs are developed in four forms: the single-side single-layer (SSSL), single-side double-layer (SSDL), double-side single-layer (DSSL), and double-side double-layer (DSDL). A single sided-single layer DVD can store 4.7 GB data and two-layer DVD can store 8.5 GB of data. A double sided-single layer DVD can store 9.4 GB of data and double-sided double layer DVD can store 17 GB of data. CD-ROM drives can upgrade to DVD-ROM drives. One can play a CD-ROM on a DVD drive, but DVD 13 discs cannot be played on CD-ROM drives and also DVD-Video cannot be able to play a DVD-ROM. The application of DVD-RAM and DVD-RW include data archiving software development, video and audio editing, and recording one's own optical discs.

1.4.3 Internet

The internet, which is now well developed, provides unprecedented opportunities for storage, retrieval and dissemination of information. Internet provides access to the most diversified source of information hosted by individuals and various organizations worldwide on a vast network of servers. The emergence of Internet offers very high bandwidth, which will widen the scope for information processing and dissemination as never before. A user will be able to cross-correlate information in multiple ways and that too from selected sources in this new networking environment.



1.4.4 VEDIO CONFRENCING

Video conferencing is an exciting new way to hold face-to-face meetings and to send pictures, sound and text from one location to other locations. It is the transmission of video and audio back and forth between two or more computers at different locations with the power of telecommunication. It is convenient and less expensive for conducting a conference between two or more participants situated at different remote locations. In addition, it is often possible to share computer applications such as Internet pages, library catalogues, software, etc. Video conferencing can be grouped into two types. They are Room-size Video Conferencing and Desktop Video Conferencing.

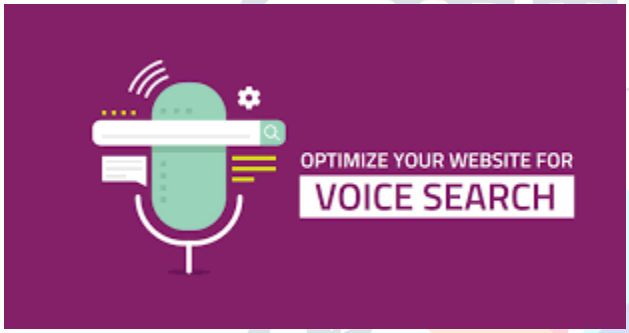
1.4.5 VOICE MAIL

Voice mail facilitates oral communication. A special device, called codec, converts the analogue single of the sender's voice into a digitized message. The message is transmitted over the network and stored in a

server at the receiver's end. A blinking light on the receiver's phone indicates that he or she has a voice message. When the receiver chooses, the digitized message is retrieved from the server, reconverted into analogue from, using a codec at the receiver's end, and the receiver 16 receivers it over the phone. Voice mail ensures that message reaches the right party even when that party is not available. Some voice mail systems can send the same message to several people, reroute a message to another phone and save messages for future reference.

1.4.6 VOICE WEB

Voice browsing is much like clicking link on a traditional website to navigate the Internet. In the case of voice browsing, though, the browser is a voice-recognition engine that deciphers vocal commands given in a natural language by the user. This is not the same as the wireless web, which uses a small screen on a mobile device such as a phone or personal organizer. Rather, than user is able to vocally navigate content, much of which has been re-formatted from existing web content using an XML hybrid known as voice XML. Voice-enabled websites increase interactivity as well as effectiveness.



1.4.7 PUSH TECHNOLOGY

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1.4.8 INTERNET 2

Internet2 is a collaborative effort by over 120 U.S. universities to develop advanced Internet technology and application vital to the research and education missions of higher education. It is a project of the University Corporation for Advanced Internet Development (UCAID) and is working with industry and the federal government. Internet2 will not replace the Internet. Rather, its goal is to enhance the current Internet.

1.4.9 WIRELESS TECHNOLOGY

Over the last several years, wireless technologies have progressed and achieved success in various fields like healthcare, education, manufacturing, etc. Wireless technology has been around libraries for some

years. But now only the libraries have realized benefits for information service and library management activities. A number of libraries in western countries are using this technology.

Wireless technology is very fast, reliable and highly flexible. Its major benefit is the immediate access to digital resources. It enables users to simply and easily connect a wide range of computing and telecommunications devices without the need to buy, carry, or connect cables. It uses a variety of devices such as laptop and notebook computers, tablets, personal digital assistants (PDAs), email-only devices, hand held 19 computers, etc. Wireless technology allows users to access the Internet without the constraints of cables, data lines, phone jacks, or even walls. Wireless data-translation protocols allow disparate devices to use the information from all sources effectively.

1.4.10 WIRELESS NETWORKING

Wireless networks use high-frequency electromagnetic waves, either infrared (IR) or radio frequency (RF) to transmit information from one point to another without relaying on any physical connections. RF is expected to be of more practical use in library networking than IR, because it is not limited by line-of-sight transmission; radio waves travel through wall and windows. Data and voice traffic is superimposed or modulated, onto the radio waves or careers, and extracted at the receiving. Multiple radio careers can exist in the same space at the same time without interfering with each other by transmitting at different frequencies. There are a large number of different technologies that can be used in wireless library network applications. Following are some of the technologies for wireless networking.

1.4.11 BLUETOOTH

Bluetooth is a global de facto standard for wireless connectivity and is based on low-cost, low-power, short-range link for mobile devices and for Wide Area Network/Local Area Network access point. It offers fast and reliable transmissions of both voice and data over the globally available 2.4 GHz ISM (Industrial, Scientific and Medical) band. Bluetooth will enable users to connect to a wide range of computing and telecommunication devices without the need to buy, carry, or connect 20 cables. And because Bluetooth utilizes a radio-based link, it doesn't require a line-ofsight connection in order to communicate. When two Bluetooth equipped device come within 10 meters of each other, they can establish a connection.

Bluetooth uses a radio link to connect devices instead of cable and it can handle raw data of 1 Mbps with a peak asymmetric asynchronous throughput of 721 Kbps or three symmetric voice channels of 64 Kbps. Bluetooth has sufficient in built encryption and authentication. Bluetooth eliminates the need for numerous cable attachments for connecting practically any kind of communication devices. The range of each radio is approximately 10 meters, but it can be extended to around 100 meters with an optical amplifier. Up to eight device can be connected together wirelessly in a network called a 'picone'. A master unit is the device in a piconet whose clock and frequency hopping sequence are used to synchronize all other devices in the piconet. There is one master unit per piconet. Slave units are all devices in a piconet that are not the master. The slaves receive frequency hopping sequences from the master and relay on the master's clock for the timing of the piconet. Up to 10 piconets can come together to form a 'scatter net' resulting a total of 80 device that are able to communicate through the network.

1.4.12 INFRARED

IrDA is a wireless technology that uses infrared, a faster wave frequency that is closer to visible light. It is a cable replacement technology similar to Bluetooth wireless technology. It has a short transmission range, 15 feet to 5 meters. Two devices must have an almost direct line-of-sight to connect. It transmits data in a 21 point-to-point configuration. IrDA technologies did not develop with interoperability and industry standardization as a primary goal, as did Bluetooth.

1.4.13 HIGH PERFORMANCE RADIO LOCAL AREA NETWORK

High Performance Radio Local Area Network type 2 (HIPERLAN/2) provides high-speed multimedia communications between different broadband core networks and mobile terminals. HIPERLAN/2 relies on cellular networking topology combined with and ad hoc networking capability. It supports two basic modes of operation: centralized mode and direct mode. The centralized mode is used in the cellular networking topology where each radio cell is controlled by an access point covering a certain geographical area. In this mode, a mobile point. The direct mode is used in the ad hoc networking topology, where a radio cell covers the whole serving area.

1.4.14 WIRELSS LOCAL AREA NETWORK

A wireless Local Area Network (WLAN) is a flexible data communication system implemental as an extension to, or as an alternative for, a wired LAN. It uses a high speed, radio-frequency (RF) network access technology to transmit data. It links computers to each other or to networks for shared access and Internet based information. The Institute of Electrical and Electronic Engineers (IEEE) established the 802.11b standard for wireless networks, and the Wireless Compatibility Ethernet Alliance (WECA), assures that Wireless LAN products are interoperable from 22 manufacturer to manufacturer. Wireless LANs have a range of technologies and each technology comes with its own set of advantages and limitations. The important technologies are Narrowband Technology, Spread Spectrum Technology and Infrared Technology.

Infrared (IR) systems use very high frequencies, just below visible light in the electromagnetic spectrum to carry data. Like light, IR cannot penetrate opaque objects; it is either directed (line-of-sight) or diffuse technology. Inexpensive directed systems provide very limited range and typically used for personal area networks but occasionally used in specific wireless LAN applications.

1.4.15 WIRELESS NETWORKING LIBRARIES

Wireless networking help users to access digital information without connecting physically, and system administrators can set up extend networks without installing wires. Mobility is the most attractive feature of wireless networking. It is more flexible than wired networking. It provides all the functionality of wired networking, without the physical constraints of the wire. Wireless networking can be used to access the library network, library resources and Internet without plug in by wires and cables. Wireless networking will allow users with devices like laptops, notebooks, computers, PDAs, tablet PCs, etc to move freely in the library while remaining connected to the library network.

Libraries can be saved from the constant wiring and rewriting by installing wireless networks. Libraries can get lot of space by wireless networking. Installation of wireless network is very easy because there are no wires. Wireless network components can be set up anywhere in the library. Wireless 23 networking makes it easy to move computers and other devices without the need to reconfigure the network.

1.4.16 MOBILE TECHNOLOGY

Mobile technologies provided wide coverage to access information from networks. There are several mobile technologies. Here are some of the most used mobile technologies.

1.4.17 THE GENERAL PACKET RADIO SERVICES

The General Packet Radio Services is a service they allows mobile phones to be used for sending and receiving data over an Internet Protocol based network. GPRS enables wireless access of Internet, enabling users to access E-mail and other Internet applications using mobile phones. As in Internet, GPRS data is also handled as a series of “packets” that can be routed over several paths through the network. GPRS enables any service that is used over the Internet like File Transfer Protocol 25 (FTP), web browsing, chat, E-mail, and telnet. It allows information to be transmitted more quickly and efficiently and facilitates instant connections whereby information can be sent received immediately as the need arises. To use GPRS, users need a mobile or terminal that supports GPRS and subscription to a mobile telephone network that supports GPRS. Users should know how to send and receive GPRS information using the mobile devices.

1.4.18 DIGITAL LIBRARY

The widespread use of Internet and the wide availability of affordable computing equipments have created tremendous interest in digital libraries. Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching and using information. They are an extension, enhancement and integration of variety of information institutions where resources are selected, collected, organized, preserved and accessed in support of user community.

Digital Library Federation defines digital libraries as 'organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities'. Digital libraries differ from their counterparts in significant ways: storage is digital, remote access is quick and easy, and materials are copied from master version.

Furthermore keeping extra copies on hands is easy and not hampered by budget and storage restriction, which are major problems in traditional libraries. A digital library collection may include two types of 26 information resource. One type comprises the "digital original resources, which are sometimes referred to as resources, which are "born digitally". The other type comprises "digital surrogates" which are created from traditional information resources through format conversion. Digital information presently exists in a variety of formats: OPACs, library networks, CD-ROMs, local databases, online commercial databases, the World Wide Web, image libraries, audio libraries , digital video libraries and so on and so forth.

The concept of a digital library cannot be reduced merely to a digitalized collection with information handling tools. It is to be viewed as a mechanism for providing information services, because its inherent design combines end-user needs with technology that has the ability to handle vast amounts of complex data. The emergence of Internet2 offers very high bandwidth, which allows digital libraries to provide real time information services and also offer opportunities to enrich and extend the current state-of-the-art in information access and retrieval.

1.4.19 VIRTUAL LIBRARY

Virtual Library or in simple words the Internet based digital library is defined as 'a library with little or no physical plant of books, periodicals, reading space or support staff but one that disseminates selective information directly to distributed library customers, usually electronically'. The concept is that any person who has computer by which he can make connection to the library network(s) can access not only the resources of the library but also access variety of information that is available nationally and internationally through networks, like internet, intranet, without being physically present in library. It is an amalgamation of the three basic 27 things : computer network, telecommunication media and reading materials in electronic format. The service of a Virtual Library is far better than a traditional one, since a user could retrieve information in a short span of time without visiting the library.

1.4.20 MULTIMEDIA

Multimedia means the integration or combination of various medias like text, graphics, animation, video and sound files into an electronic environment. It provides the interactive and attractive environment for the presentation of data using user friendly interfaces and hypertext links. Video conferencing, voice chatting, computer animation, desktop publishing are some of the finest testimonies of the growing importance of multimedia. Multimedia technologies are designed to enable users to integrate and manipulate data from diverse source on a single hardware platform.

1.4.21 ELECTRONIC JOURNALS

Electronic journal may be defined broadly as any journal, magazine, e-zine, newsletter or type of electronic serial publication which is available over the internet and can be accessed using different technologies such as World Wide Web, Gopher, ftp, telnet, e-mail or listserv. In some cases, print equivalents exist; in some cases, not. Some electronic journals are freely available; other charging mechanisms of different types.

1.4.22 E BOOKS

Locating relevant information in a timely manner is critical for both the researcher and the information professional. Electronic books (e-Books) are one way to enhance the digital library with global 24-hours-a-day and 7-days-a-week access to authoritative information, and they enable users to quickly retrieve and access specific research material easily, quickly, and effectively. It is crucial to not only prove these electronic resources, but to integrate them into library streamline library operations, as well as promote user adoption.

As an e-Book provider, net Library, a division of online Computer Library Centre (OCLC), has been involved in the selection, cataloguing, and distribution of e-Books, Library users are able to remotely search, locate, and checkout e-Books from the library's online public access catalogues (OPACs). As with any new opportunity, new challenges emerge and utilizing the internet to deliver book content is no exception. Integrating e-Books into 29 the digital library has created challenges and opportunities for librarians, publishers, and e-Books providers.

1.5 EMERGING TECHNOLOGIES

1.5.1 SMART CARD

Similar in look and size to a credit card, smart card has an embedded microprocessor or memory chip, or both, instead of magnetic strip commonly found on credit and debit cards. It provides not only memory capacity, but computational capacity as well. The self-containment of smart card makes it resistant to attack, as it does not need to depend upon potentially vulnerable external resources. This technology will have several applications in identification, authentication, access control, healthcare, finance, administration, etc. Application of smart card in library delivers increased efficiency by providing a means of regularly updating the library's inventory and maintaining an accurate control of borrowing records.

1.5.2 RIFID TECHNOLOGY

RFID stands for Radio Frequency Identification use radio waves to uniquely identify an object by transmitting a stored code from a chip to a reader. It is a form of automatic identification and data capture technology. It has a combination of radio frequency and microchip technology. It stores ad retrieves data from computer chips using radio frequency transmission. It does not require line of sight contact and it can be used anywhere that needed a unique identification. It is an emerging, more effective, convenient, and cost efficient technology in library automation and 30 security.

Libraries began using this technology in the late 1990s. Several libraries around the world, especially in U.S., Canada, and Singapore are using this technology for library functions. RFID technology has many advantages. As far as a library or information centre is concerned it will increase the speed of changing and discharging of documents, RFID tags can detect and read much faster and it can read several documents at the same time. Library users can charge several documents simultaneously using special self-charging stations and return documents in the special boxed or book drop making circulation faster and easier.

Library staff can relive from repetitive and clerical tasks and they can concentrate on more demanding personalized information services. RFID can sort documents automatically and library staff can shelve documents very easily. Library staff can use portable hand held readers for electronic inventorying by passing them rapidly along the shelves to read all the documents. There is no need of handling each document individually. They can report the lost, hidden or unordered documents more easily using there portable readers.

1.6 LIBRARY AUTAMATION

Computer application in library and information field has made phenomenal progress in industrialized countries where hardware, software and communications facilities are well developed. In view of their technological advancement, they are able to computerize their entire library and information system in the country, with great success. Besides improving services and operations for a better performance, 31 libraries are able to evolve effective computer networks, towards optimum utilization of resources and facilities. International programs like UNISIST/UNESCO, Universal Availability of Publications (UAP) and Universal Access to Information (UAI) of IFLA and a few others have helped in promotion and coordination of information services through out the world. IDRC, Canada, EEC, Brussels and similar other have helped developing countries to strengthen their information infrastructure.

The library networking is based on three major areas of technology, viz., creation of bibliographic information in machine readable format for storage and retrieval, hardware/software for database use and services and telecommunication mechanism for transmission of information. The major point of success of library network depends upon availability of machine readable catalogues in the constituent units. A great progress has been made by USA in this regard. The latest trend is use CD-From technology for storing the catalogue data.

The OCLS, established IN 1967, and has a staff of 812 persons (as on 1987) is a non profit organization and support resource sharing among a more than 6,700 libraries in USA, besides countries in Europe, Saudi Arabia and Australia. Its union catalogue database contains 13 million records; some 30,000 records are added every week. With the steady growth of OCLC, there has been a progressive decline in the amount of original catalogue to be done by the participating libraries. The system hit rate has increased from 66 per cent in 1971 to 94 per cent in 1983.

The details about telecommunication system, input sources. RLIN, established 32 in 1978and which has as staff of 81 persons, supports the cooperative programs of Research Libraries Group, comprising 36 major libraries and other research institutions. It maintains 6 databases online. The catalogue database holds more than 20 million records. WLN, established in 1972 and which has a staff of 51 persons, provides, more than 250 libraries in seven states of USA, online computerized services to promote resource sharing ad automated library functions. The bibliographic file contains more than 3.5 million catalogue records.

1.6.1 ONLINE PUBLIC ACCESS CATALOGUES

The ALA Glossary defines online public access catalogue as ‘a computer based and supported library catalogue (bibliographic database) designed to be accessed via terminals so that library users may directly and effectively search for and retrieve bibliographic records without the assistance of a human intermediary such as a specially trained member of the library staff’. Online catalogues were developed in the late 1970s and since then have become widely accepted as the contemporary form of catalogue in the developed world. An online catalogue database normally consists of bibliographic records.

The ability to search by keyword liberates the user from the need to have full author or title information. OPAC allows searching by name, title, subject and keywords and offers online access through terminals. One of the major advantages of an online catalogue is that if linked to any automated circulation system it can indicate the current status of an item. The concept of Web PAC is recent origin and it is serving as a gateway

to the resources no only held by the respective library but also to the holdings of other 33 participating libraries without limiting to local collection but going beyond further to regional, national and international levels. It allows users to interact with documents stored on computers all over the world and makes easier access to catalogue data in the form of bibliographic records. It becomes another search engine referred as 'Web Cats' and as an 'Information Gateway'. It can support protocols such as telnet, http, ftp and Gopher and can support files and documents like Portable Document Format (PDF), Hypertext Mark-up Language (HTML) and Standard Generalized Mark-up Language (SGML).

1.6.2 LIBRARY NETWORKS

An information network is a set of interrelated information systems associated with communication facilities, which are cooperating through more or less formal agreements and institutional agreements, in order to jointly implement information handling operation, with a view to pooling their resources and to offer services to the user. They generally follow identical or compatible rules and procedures. A library network consists of six major components:

• Information resources

• Reader of users of information

• Schemes for intellectual organization of data/documents

• Methods for the delivery of information to user- the output 34

• Formal organization – cooperation, whether voluntary or obligatory, in information exchange and utilization.

• Bidirectional communication links Based on these components, the essential requirements of INFLIBNET can be identified as :

• Libraries (University, R&D Institutions, etc.)

• Computer facilities (Main Frame, Mini & Micro computers

• Machine-readable database (Library holdings, Union catalogues, National & international database)

• Reprographic facilities and

• Communication link (Telephonic, postal or satellite communication channel)

1.7 HYPOTHESES

The following are the major hypotheses of the study. The application of information and communication Technologies in University Libraries in Uttar Pradesh is far from Satisfactory.

1. Among the University Libraries in Uttar Pradesh, libraries of central University are in better position in the application of information and communication Technologies. 40

2. Lack of fund/financial support hinders full application of information and communication technologies in University Libraries of Uttar Pradesh.

3. The electronic information resources and services of University Libraries of Uttar Pradesh are inadequate to fulfill the information needs of users.

4. The skills and expertise of library professionals in University Libraries of Uttar Pradesh are inadequate to provide information and communication Technology based resources and services.

5. University Libraries of Uttar Pradesh are providing adequate training in ICT based operation and services to their professionals.

6. Librarians and the library staff of University Libraries of Uttar Pradesh have a positive attitude towards the application of information and communication Technologies.

1.8 METHODOLOGY

The present study is to find out "Information Communication Technology Applications in the University Libraries of Uttar Pradesh: An Analysis". The researcher has selected the 32 universities libraries of Uttar Pradesh. Thrust has been investigated the impact of information communication technology and Uttar Pradesh university libraries. For this purpose review of literature has been collected to find out the contribution in these subjects.

Therefore, collection of the required factual data with the following objectives were done

(i) The existing situation and practice in university libraries and the future planning with 41 regard to the information communication technology.

(ii) (ii) To know "use of information and communication technology" provided by the libraries, the survey have been divide into section and sub sections, which contained variables describing the nature of library, their collection, year of establishment use of information communication technology by them

(iii) which contained variables describing the kinds of library services offered, whether manual or with help taken from computers.

The data and information collected were examined with special reference to impact of information communication technology. Questionnaire method was used to collect the data. The investigator went directly and collects the data. All the collected data have been used for analysis.

1.8.1 DATA COLLECTION MEATHOD

In order to accomplish the objective of the study, the following methods have been employed

1.8.2 QUESTIONNAIRE SURVEY

Structured questionnaires were prepared and administered to chief librarians of the libraries (Appendices A) structured questionnaires are simple to administer and relatively inexpensive to analyze. These questionnaires were pre-tested before the final application .the purpose of questionnaire target to librarians was to obtain data regarding the state-of-the-art information and communication Technology infrastructure, and contemporary of ICT, to identify and analyze the specific factors that promoted or hindered application of information and communication technologies, to assess librarians attitude towards application of information and 42 communication technologies and to investigate the skills and

expertise of the library professionals. This questionnaire was distributed to chief librarians with a covering letter indicating the significance of the study and intends plans for the results.

1.8.3 SEMI STURCTURED INTERVIEWS

The method of collecting information through personal interviews is usually carried out in a structured way. This is called structured interviews. Such interviews involve the use of a set of predetermined questions of highly standardized techniques of recording information. For the present study, of both telephone and face- to- face interviews were conducted with chief librarians using a semi-structure interviews schedule the purpose of interviews was to complement the quantitative information obtained by the questionnaire with more detailed qualitative information. This method provided the interviewer with the opportunity to clarify some questions of which respondent was unclear. The interviews directly addressed the application of information and communication Technologies in University libraries of Uttar Pradesh and for a personal response than the questionnaire

1.8.4 OBSERVATION OF LIBRARIES

Observation becomes a scientific tool and method of data collecting for the research, when it serves a formulated research purpose, is systematically planned and recorded and is subjected to check and controls on validity and reliability. For the present study, observation visits were conducted in a library to collect information about a current state-of-the-art ICT facilities, resources and functions, to ascertain the ICT skills and expertise of the library professionals and examine its application in 43 information handling process and to assess the degree of the utilization of ICT based facilities and services for storage, retrieval and dissemination of information.

1.8.5 SAMPLE SIZE

The universe of the present study was the librarians of the Universities of Uttar Pradesh, All the libraries and communication Technologies were selected for the present study. Since the use of information and communication Technologies require certain minimum infrastructure and qualified full time library professional and also ICT resource and related equipments require substantial financial commitment by libraries. The investigator identified 32 libraries with various stages of ICT application and library automation. But after several attempts three library did not grant the permission to collect data, and in 4 universities only departmental libraries exist hence, it has been excluded from the list.

Finally 32 Library were selected for the study. Among these 4 libraries are from Central Universities, 6 are from Private Universities, 8 libraries are Deemed Universities, 14 are from Sate Government Universities. These libraries were selected out of more then existing University libraries of Uttar Pradesh on the basis of the following criteria:1.All these libraries represented the categories explained above. Pilot study was conducted in five prior to the survey proper, in order to elicit any possible criticism of the questionnaire or ambiguity in phrasing of the questions. Data was collected from the Libraries of the all selected Libraries through a questionnaire .

The questionnaire comprised fourteen section and was completely structured, including spaces for open-ended comments. The data collection was starting during July 2009 and all the completed questionnaire 44 were received by the end of September 2011, thus, achieving a 100per cent response rate. The information from the questionnaire survey was updated through semi structure interviews with

chief librarians and observational visit to the Libraries. Data was collected from the users of these libraries with the help of a structured questionnaire. The data were treated confidentially and were processed by using the SPSS Software

1.9 STATISTICAL TOOLS AND TECHNIQUES

The present study is design to assess the contemporary application of Information and Communication Technologies in University Libraries of Uttar Pradesh and to help plot future direction for implementation Information and Communication Technologies. To meet the specific objective and quantitative qualitative research methodologies along with a comprehensive literature has been employed.

1.9.1 PERCENTAGE ANALYSIS

Simple percentage analysis was undertaken to study the current state-of-art, infrastructure, application of information and communication Technologies in special Libraries in Uttar Pradesh. This was done for the libraries and library users in different categories well as for

1.9.2 CLUSTER ANALYSIS

The cluster analysis is one of the method of grouping large sums of data. It is classificatory procedure. The objective id to group either the data units or the variables into cluster have a high degree of 'natural association' among themselves, while the cluster are 'relatively distinct' from one another. According to Aldemderfer and Blashfied a clustering method is a multivariable Statistical procedure that starts with data set containing information about a sample of entities and attempts to reorganize these entities into relatively homogeneous groups. For the present study cluster analysis was employed to study the attitude of librarians and users towards ICT application and to study the barriers of ICT application in special libraries in Uttar Pradesh.

1.9.3 ANOVA

ANOVA is essentially a procedure for testing the difference among different groups of data for homogeneity. The essence of ANOVA is that total amount of variation in a set of data is broken down into two types, that amount which can be attributed to chance and that amount which can be attributed to specified causes. There may be variation sample and also within sample items. ANOVA consists in splitting the variance for analytical purposes. Hence it is the method of analyzing the variance to which a response is subject into its various components corresponding to various sources of variation

1.10 CONCLUTION

The world is changing so rapidly that it is difficult to foot step with this change. The knowledge explosion is a concept of today's world. ICT has made it more complex that it is very difficult to pace with this fast changing. The education has great implication of ICT. Now there is a need to improve the quality of our education which is possible only through improving our quality of teaching particularly secondary and higher secondary education. For that, ICT need to be used in education to keep the pace with this fast changes. In this regard teachers has great roles to play. Teachers need to be aware about ICT and should use ICT in their teaching learning process. The present study through some lights on ICT awareness, use and need of secondary and higher secondary school teachers.

REFERENCE

http://shodhganga.inflibnet.ac.in/bitstream/10603/10271/7/07_chapter%201.pdf

https://shodhganga.inflibnet.ac.in/bitstream/10603/189063/10/10_chapter%202.pdf

https://www.oecd-ilibrary.org/information-and-communication-technology-and-its-impact-on-the-economy_5jxv8zhcg7g8.pdf?itemId=%2Fcontent%2Fcomponent%2F9789264218789-6-en&mimeType=pdf

https://en.wikipedia.org/wiki/Information_and_communications_technology

https://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies

https://www.sciencedirect.com/topics/computer-science/information-and-communication-technologies

https://www.quora.com/How-can-you-describe-the-components-of-information-communication-technology

http://www.lisbdnet.com/components-of-ict-in-library/

https://www.britannica.com/list/5-components-of-information-systems