CHAPTER 2
REVIEW OF RELATED STUDIES

2.1 Introduction

Information is a key currency in today’s society with ICT as its primary means of delivery. To bridge the gap between the information rich and information poor is essential by ensuring that no one is denied access to these services due to any disability or lack of equipments that exists in order to broach such difficulties at the point of access to ICT services (Cahill and Cornish 2003, p.193). The information technology has progressed rapidly but the socially disadvantaged such as the disabled are marginalized from the benefits of information services. Today the biggest problem faced by the disabled is the insufficient access to digital information services provided by the libraries. The assessment of the usability of information by the disabled should be carried out to have the profound understanding of the information needs and information use behavior of the disabled to advance library information services for the users with disabilities (Kwak and Bae 2009). As the information needs of the disabled are similar to those who are not disabled, therefore libraries can act as the common platform to minimize the gap of ability and disability by ensuring an effective library service to all its patrons. Also, there is an urgent need for training 'Library managers' and 'Library workers' to understand the nature of disability and help such users according to the severity of their disability (Kishore 1999, p.1-2).

In the evolving information-based society, providing digital information services to the people with disabilities has become an issue of major concern for the libraries. As, today if libraries emphasize on the offline contents like a Braille book for the blind, it is nothing but an anachronism (Kwak and Bae 2009, p.638). People with disabilities are part of every demographic group imaginable. Thus, regardless of library type or location, people with disabilities represent an identifiable component of the constituency a library serves (Chalfen and Farb 1996, p.51). As Librarianship is an enabling profession, librarians need to think beyond their personal discomfort and try to provide the same level of service to this category of population as they do to more physically or mentally capable persons (Cohen 2006, p.62-63).
The Library Profession has long championed in providing services and materials to all its patrons equally which is one of the fundamental beliefs inherent in this profession (Riley 2002, p.179). In India, the National Knowledge Commission (NKC) have asked the librarians ‘to identify the constraints, problems and challenges to recommend changes so that necessary steps can be taken to mobilize and upgrade the existing library and information systems and services’. Hence, libraries can provide the leadership role to show their expertise and initiate new innovative means to develop and provide specialized services to these special groups who do not have access to the normal services as it is the democratic right, constitutional right of the differently-abled users (Roy and Bandyopadhyay 2009, p.629).

As Cantor (1996, p.45), states that “The accessibility of your library will not be judged by the sophistication of the technologies you have, but by the comprehensiveness of the services you offer.” Therefore, an exhaustive literature review has been done to understand the role that libraries can play to bridge the information gap for the people with disabilities by identifying and analyzing their needs and providing the necessary solutions to the problem of information storage and access with the advancement in the assistive technologies. The literature review begins with a discussion on disability divide in the digital age from the perspective of information access and disablement for the people with disabilities. The review focus on the other areas like information resources available for the people with disabilities to equalize the information gap between the disabled and those without disability, the role of libraries in providing the barrier free environment by studying the information seeking behavior of the users and providing appropriate information and services to them based on the standards developed for the equitable access of the library. The importance of the disability awareness training to the library staff is discussed along with the orientation and training programmes for the users. Finally, the study addresses the value of assistive technologies for the disabled in information access along with the exploration of problems and issues during the accessibility of the web resources accompanied with the necessary recommendations to design an accessible user interface to access the World Wide Web.
2.2 Disability Divide in Digital Age

In the present digital age, ‘disability divide’ represents an important initial framework for understanding and raising the awareness to address the complexities of information access for the people with disabilities. In this section, the concept of ‘digital divide’ is discussed along with the definitions of ‘disability divide’. The role of libraries in the light of ICTs is discussed along with the nature of services and facilities provided to the disabled community in terms of information access with the help internet and adaptive technologies. The collection development issues are highlighted focusing on the inclusion of the digital formats and products for storing the information for the differently challenged population. People with disabilities constitute an invisible minority group which is most drastically affected by the information technology industry today.

2.2.1 Emergence of Disability Divide

Information is an integral part of all human activity and the information technology plays an important role to shape the lives of the people. The modern information technologies has brought the information revolution which is responsible for creating a divide, the ‘digital divide’ between those with and without access to information technology which segregates the ‘info-rich’ from the ‘info-poor’. The digital divide, both as a concept and a reality, inadequately addresses the problematic issue of information access in relation to disability (Chaudhry and Shipp 2005). In the present digital age, this has become a convenient metaphor to describe the perceived disadvantage of those who either are unable or do not choose to make the use of digital technologies in their daily life (Cullen 2001, p.1). As the term implies the ‘digital divide’ focuses on the higher end of ICTs involving the electronic transfer of information using digital formats which may be then replaced by new technologies in the next decade (Cullen 2003, p.247). Generally, the digital divide “refers to that disparity between individuals and/or communities who can use electronic information and communication tools, such as the Internet, to better the quality of their lives and those who cannot” (Salinas 2003, p.132).

The term, “disability divide,” a variant of digital divide, has recently emerged into the mainstream as it relates to the disabled community (Baker and Bellordre 2003). People with disabilities are one of the specific categories of people, those do not have access to or has limited access to the information technologies, especially the internet, which can
be referred to as ‘disability divide’. According to Baker and Bellordre (2003), the term “disability divide,” “is meant to refocus awareness of how the digital divide...affects people with disabilities specifically and to address the gap that remains between abled and disabled people despite advances in assistive technologies and more widespread awareness of implementing universal design”. Today libraries are treated as one of the major social tools which can solve the problem of information divide rooted in the digital divide to contribute successfully to the realization of democratic society (Aqili and Moghaddam 2008, p. 231). Therefore, libraries need to play an important role in closing the digital divide with their commitment to freedom of access to information and promotion of life-long learning (Cullen 2001, p.12).

2.2.2 Disability Divide in Digital Environment

There are various studies addressing the issue of ‘digital divide’ for the disadvantaged group of people like the unemployed, elderly or rural people but less studies sheds light on the people with disabilities addressing the ‘disability divide’. Aqili and Moghaddam (2008) focus on several dimensions of the digital divide that pertain to service as well as the responsibilities of libraries and emphasize on the role of librarians and information professionals in bridging the digital divide. The phrase ‘digital divide’ applies to the gap that exists in most countries between those people who are provided ready access to the tools of ICTs and those who are without such access or skills. The reason may be socioeconomic factors, geographical factors, educational, attitudinal and generational factors, or it may be due to the physical disabilities.

A number of research and policy papers addressing the issue of the Digital Divide identify specific groups of people who are especially disadvantaged in their uptake of ICTs which includes people with low incomes, people with few educational qualifications or with low literacy levels, the unemployed, elderly people, people in isolated or rural areas and the people with disabilities (Cullen 2003, p.248). The digital libraries are for everyone and the concern over a growing ‘digital divide’ has prompted research into appropriate interfaces and access methods for individuals with disabilities. The digital library can be used by the specialized kinds of users, like a user who has a profound physical disability and cannot communicate verbally or unable to use conventional communication tools etc. to access information with the help of various
assistive devices including softwares and hardwares like three onscreen keyboards which resembles a mobile phone keypad (Dunlop, Cunningham and Jones 2002). In this regard, Aqili and Moghaddam (2008, p.226) suggests that to overcome the digital divide, librarians need to redesign and redefine their service menu for the users through thinking functionally. They also need to review the various IT devices and information services available to provide a more effective library service. According to Plumb (2008) the librarian has a social responsibility to be knowledgeable about the digital divide as they may face many challenges to take on the digital divide like issues of access, content management, technical literacy, privacy, civic participation, education, employment and political debate.

With the emergence of digital technology, the collection development has also changed as earlier mainly printed material like books, magazines etc. constitutes the core collection of the library but today the technological advances have produced information packed in an assortment of formats and resulted into the products like online databases, CD ROMs, multimedia kits, DVDs etc. (Salinas 2003). Similarly, for the people with disabilities, the Braille, large print and analog tapes are no longer the only possible formats but the libraries are adding digital formats for the disabled people to read text and listen to audio books. Therefore, due to the emergence of such changes in collection development with the proliferation of formats and products, libraries are challenged to plan their services with all the possible formats (Epp 2006, p.415) in mind to derive the solutions to bridge the digital divide to continue to work on the mission of providing equal access regardless of the format.

2.2.3 Impact of ICT on Disability Divide

Human resources and information technologies are identified as major challenges to the future of information access for the people with disabilities. The people with disabilities are already affected by disparities in education and income therefore further marginalization of the communication and information access creates a greater barrier to their access to critical information needs and effective participation in a community (Baker, Hanson and Myhill 2009). The development of the Internet has made possible unprecedented access to information but evidences shows that the people with disabilities lag behind the rest of the population in Internet use. This lower level of internet use
among those with disabilities is mainly due to the fact that they have to incur the extra costs of the adaptive technology for accessing the Internet (Vicente and Lopez 2010). Another significant factor which prevents the internet use by many disabled people is the lack of ICT skills and support to them (Cullen 2003, p.250). Huang and Russell (2006, p.162) states, “People with disability are only half as likely to have access to the internet as those without a disability”. To overcome these problems, users need to receive adequate training and educational opportunities that can enhance their use of the computer and internet with the help of few vital skills like evaluating search engines, choosing alternate keywords and initiating their own searches to achieve optimal results in their quest for information (Russell and Huang 2009, p.72). The demand for access to the Internet by people with disabilities is steadily increasing and now it has become a human rights issue. There are several factors which inhibit the use of ICTs by the people with disabilities depending on the type of disability an individual has (Dobransky and Hargittai 2006), like people with physical disabilities inhibit keyboard use, visual impairment inhibits screen use and learning disabilities prevent large numbers of users from participating in the benefits of the Internet and its rich resources (Cullen 2001, p. 4). According to experts estimate, only 5 percent of the world's publishing output is made accessible in alternate formats for people who cannot use print due to a visual, physical, neurological or perceptual disability and need the help of the libraries to have the equitable access to information for which libraries need strategic partnerships, improved public policy and international agreements to fulfill the promise (Epp 2006). As, no single institution or library can overcome the digital divide on its own therefore libraries need to work together and partner with local communities, charitable organizations and private sectors to accomplish their goal (Russell and Huang 2009, p.73).

The above studies focus on to minimize the gap that exists between the information technologies and the people who cannot make use of these technologies due to one or the other reason, whether due to disability or insufficient technologies available in the libraries. Libraries need to work in collaboration with each other to bridge the ‘digital divide’ so as to overcome the ‘disability divide’ as multi-dimensional efforts are required to succeed in providing the impartial access to the library users and especially the people with disabilities. The studies reveal that Information and Communication Technologies
with the help of assistive or adaptive devices are one of the most important enabling tools to bridge the digital divide for the disabled people. The studies suggests that the creation of ICT infrastructure in a well-planned manner along with the design of appropriate IT tools according to the requirements and capabilities of the users can certainly prove useful to lessen the information gap. While the ‘disability divide’ is an issue of recent concern but the technology divide has been the issue from last many years. The librarians need to keep them update with the changing technology as they have the responsibility to enable a wider population to benefit from technology and information revolutions.

2.3 Information Resources for the Disabled in Digital Era

The Information world is rapidly changing. There is shift in technology from analogue to digital which has resulted in a change in the availability of information resources in a variety of formats to the users. People with disabilities are one the most important segment of society which is largely affected and benefited from the new technologies of the electronic age. This section highlights the role of digital technology in the provision of variety of library and information resources to the disabled user group which includes online catalogs, electronic indexes and databases of digital talking books, web-Braille system, online reference works etc. The modes of access to the information resources are discussed which can prove useful to all disabled community. The digitized catalog is considered as the ‘dynamic’ information resource to the users as it carries many dynamic properties for accessible materials which are discussed in the study.

2.3.1 Digital Shift in Library and Information Resources

Libraries are most commonly affected by the emerging digital revolution, which acts as the storage house and facilitator of information. There is hardly any library resource category today that has not shifted to at least some extent, to a digitized format. Online catalogs, indexes and full-text article databases, encyclopedias and other reference works, reserve materials as well as information about the library itself (schedules, people contacts, library tutorials and help screen) are now commonly accessed through library websites (Schmetzke 2001, p.36). In the modern digital era, access to websites and digital resources for mainstream technology users occurs almost instantaneously. The online and
digital environments possess the greatest potential to provide access to information to the individuals using adaptive technologies (Tatomir and Durrance 2010, p.577-78).

Information resources are no longer limited to the people with disabilities as now electronic information can be translated into any language needed. This technological advancement may be one of the greatest intellectual aids for the people with disabilities. There are various software programs available to translate the electronic text into Braille, speech or the sign language on command by the user. Blind and the visually impaired people are no longer bound by the limitations imposed by the print world (Mates 2004, p.10). The digital talking books acts as one the good information resource for the blind and the physically handicapped people today and has replaced the cassette talking books played on the audio tapes. The digital talking books, burned on DAISY-formatted CDs can be played in a state-of-the-art portable digital player. The DAISY-compatible player allows readers to navigate through books by page or by chapter and to place bookmarks in the text. The digital technology also enables readers to speed up the text to read faster in a natural voice which is preferred by many blind readers. DAISY is the Digital Accessible Information System standard that was developed by an international consortium of libraries for the blind beginning in 1996 (Auld 2005). From the original electronic and audio files, it is possible to produce many different formats, for example braille and electronic text which allows libraries greater flexibility in how they produce, store and distribute their collections. The increase in use of IT in education raises various issues regarding accessibility of learning and teaching resources, advice and support for disabled students and staff for e.g. more information or links to information should be available on the library website and the facility to scan and tape material should be available for print-impaired library users. The selection of technologies to aid “accessibility” is the most important feature in provision of accessible learning materials and support to the disabled users (Chelin 1999). Due to the shift of technologies from analog to digital, there is an urgent need for libraries to find a permanent solution to the perennial problem of inadequate provision of library and information materials to the people with specific type of disability, for example the resources required to meet the information needs of the visually impaired people includes Braille, large print, audio and digital files.
2.3.2 Access to Information Resources through Libraries

One of the core values of Librarianship is to ensure the access to the collections that library builds to all the users including the people with disabilities (Salinas 2003, p.132). But due to the limited experience with library services and resources, the disabled library user may be unaware of and reluctant to use many library services which may prove useful to them. For e.g. Reference services that involves the awareness of the several important topics like the ‘reference resources’ which can be useful to the deaf and hearing impaired, blind and visually impaired, and physically disabled; ‘special formats’ which are available for the print impaired and ‘current technologies’ available to facilitate library use for the disabled. The library reference materials giving information on the guides, aids, service agencies and library resources should continue to be published by the library which can provide the disabled with needed data as some reference sources provides the most comprehensive and current information available on the subject of the interest (Lane and Lane 1993).

‘Disability Studies’ is a growing interdisciplinary field which is gaining importance globally and various renowned universities are offering minors, certificates, graduate and undergraduate degrees in the field therefore libraries can provide information about the various online resources on disability with primary focus on the websites which are particularly useful for the scholars, researchers and bibliographers of disability studies. The websites offer the access to various information resources dealing with disability including open access e-books, journals and newsletters. The library website providing links information about annotated bibliographies, Art and history museums, online exhibitions, Radio broadcasts, Blogs maintaining information on disability studies along with various educational videos featuring interviews with disabled students and scholars can also prove useful to the users (Mason 2010). There are many useful websites which are devoted completely to the specific type of disability which provides variety of information on referral and support services for the people with disabilities. For example, Davis (2002, p.75-83) mention and discusses several useful websites providing information related to the developmental disability. The study focus on general sites for the developmental disability as well as more focused sites on epilepsy, autism, fetal alcohol syndrome, mental retardation, Down syndrome and cerebral palsy. Similarly,
Hearing loss is the invisible disability and the library staff generally do not recognize hard of hearing patrons simply by looking at them. Therefore, libraries need to provide guidance for finding the appropriate information with insight on the various methods and resources which can be made available to the hearing impaired patrons of the library. The list of various information resources on hearing loss should be prepared by the library along with the annotated bibliography of the resources for the hearing impaired people. A thorough weeding of the inappropriate collection is also recommended along with the technological devices which need to be discarded by the library (McKenna 2003).

2.3.3 **Dynamic Catalogue as an Information Resource**

The other issue related to the disabled users, is the lack of options for the location and selection of reading and information materials. Today many libraries are going into a new phase of digital production and trying to use the full potential of the standards to meet the user needs. Catalogs are one the important tools for the resource discovery in the library for the people with disabilities, especially the visually impaired users. The traditional library catalog is unable to meet the accessibility of information resources by the users therefore a digitized catalog has a major role to play and the advantage of storing accessible materials in a digital archive is that it facilitates large-scale updates (Westlind 2008, p. 424-26). The production and distribution of information resources in alternative formats to meet the needs of the people with disabilities is haphazard and uncoordinated if the information is not organized and properly catalogued therefore there is need to set up a computerized catalog and distribution database of alternative materials for them, especially for the visually impaired people. The distribution database is not a full-text database but it gives cataloging information about each item and the addresses of organizations serving the people with disabilities in the country etc. There is need to open wider, the gates of information resources, nationally and internationally to this category of information users by identifying the location and availability of resources and creating a database for the access and retrieval. The database could become the foundation of a network of organizations and institutions working for the disabled population (Atinmo 2007).

Designing a catalog for the disabled people requires consideration of several aspects starting with the tasks of finding, identifying, selecting and obtaining the appropriate
information suitable for them. The improvements for the people with disabilities provide several features that add benefits to sighted people as well, as both use same routes to find and select the resources appropriate to their needs (Chapman 2007). A ‘dynamic’ cataloguing solution is necessary to meet the growing number of accessible materials which are mainly digital and increasingly dynamic. What does ‘dynamic’ refer to in this context? Here, a ‘dynamic’ catalog refers to define at least five kinds of dynamic properties for accessible materials which includes digital archives that make large scale-updates possible; that can produce a variety of end user products like DAISY (six types), braille, e-text; that allows variety of distribution forms through mail, e-mail, downloads, streaming etc.; that supports a variety of available formats and carriers like .iso, .zip, CD-ROM, DVD, etc.; and lastly provides the possibility for end users to compile parts of relevant materials. For example, if there is an upgrade of the synthetic speech of a large number of talking books, all bibliographic data regarding duration, information about the used synthesis and in some cases production year also changes. In this case, all catalogue records that have been affected need to be re-catalogued manually, since the catalogue is separate from the digital archive. But in case of a dynamic cataloguing solution the catalogue collects the bibliographic data from the digital archive directly and new records for all the talking books with synthetic speech are created automatically at the same time as the books are being updated. Another advantage of a dynamic cataloguing solution is the display of potential end user products as it not only displays what already exists but also shows what potentially can be created (Westlind 2008).

The above studies discuss about the various information resources available for the people with disabilities in electronic form which can be made accessible to them with the help of ICTs and enabling technologies. Users with disabilities are sometimes unaware of the library services and resources available for them therefore librarians need to make them aware of the various information resources through library’s website, internet or through the library collection by providing them personal assistance and by publishing some reference aids and guides providing information on the library resources and subject of their interest. Also, on-demand digitizing of analog library materials can be done to increase access to current library holdings. The further studies emphasize the development of the digital catalog based on the W3C standards for the disabled
community where automatic updates are possible and the librarians need not to re-catalog the large collection manually.

2.4 Role of Libraries in Information Storage and Access

Libraries have to play a key role in building an inclusive society and serving the diverse needs of all categories of users including those with disabilities therefore a flexible approach to service provision is essential. This section aims at summarizing, comparing and presenting some of the existing studies in various countries on the role of libraries for the people with disabilities in Information storage and access by identifying their varied information needs and preference of the resources and services. The role of libraries is studied in identifying the various barriers faced by the disabled users in accessing the library services and making necessary accommodations for them. The necessity of the development of the standards for the equitable access of the library resources for the users with disabilities is also highlighted in the study.

2.4.1 Meeting Information Needs through Library Services

In the global information age, librarians need to work across borders to provide the best possible library services for the specially-abled users to provide an equitable access based on the premise that everyone has the right to information (Griebel 2003, p.156-57). The modern library and information service features access to information in all its forms along with a range of services designed to support users as well as space in which users may engage individually or collectively with information. An aspiration for the library and information service is that it is equally hospitable to users of all kinds and there should be no artificial boundaries in terms of information (Davies 2007, p.785-86). “Libraries have always been leaders in creating change, and the digital era brings yet another occasion to leave a mark” (Salinas 2003, p.135). ‘Library services for people with disabilities policy’ approved by ALA council in 2001, states that “Libraries play a catalytic role in the lives of people with disabilities by facilitating their full participation in society. Libraries should use strategies based upon the principles of universal design to ensure that library policy, resources and services meet the needs of all people”. The various studies highlighting the role of libraries for the disabled users in different
countries show that there is lack of sufficient services and facilities in serving the needs of the people with disabilities in almost all the countries.

Greek people with disabilities assert that they have almost the common requirements as the able-bodied for e.g. they have the same reading and information seeking behavior as able-bodied people and their key areas of concern include recreation/entertainment, lifestyle, life events, services, etc. In library-related literature, the Internet and computers are quite promising since they offer independence and at least a partial solution for overcoming existing barriers. The Internet is used for several reasons like for studying, e-shopping, e-mail, work, etc. Greek libraries depict the lack of library services to the disabled and acknowledges possible barriers and also presents several, recent steps of improvement and development in libraries. Furthermore, the effective library programs for disabled users are generally lacking in Greece (Koulikourdi 2008). In Iran, the role of and capabilities of the academic libraries is studied in meeting the information needs of handicapped students which aims to explore what information sources and information services especially designed for handicapped people are available in academic libraries and how the libraries manage to help the users in providing easy access to these information sources and services. It was found that the handicapped students are deprived of services and facilities in Iranian academic libraries and the special services to handicapped students are almost non-existent (Bigdeli 2009). The current status of the library services for visually impaired and physically handicapped people in Argentina is determined which analyses the current treatment of ‘accessibility’ to information and to institutional space along with demonstration of the assistive technological developments and architectural requirements for the visually impaired. It was found that the libraries in Argentina are not in a position to provide the best library services for visually impaired and physically handicapped individuals and there were many things which need correction and improvement (Todaro 2005). The library services for the handicapped have poor support in South Korea but recently; there was a new attempt to improve the accessibility of libraries for the blind using advanced information communications technology. The LG Digital Talking Book (LG DTB) Library developed a ubiquitous service that can provide the library services to the blind anytime; anywhere using mobile phones with the automated library access procedure. The information needs and the use
preferences of the library users were analyzed as a usability test of the ubiquitous library services for the blind. It was found that late updates of new publications, unbalanced subject areas and lack of educational contents are the most serious problems faced by the users but handy-to-carry information terminals like mobile phones were very much favored by the blind users. This kind of new service delivery system using high technology suggest a realistic alternative to the current situation of the libraries in which a reliable information infrastructure for the disabled users is still underdeveloped (Kwak and Bae 2009).

The public library services play a key role in supporting the needs of the population for education and learning along with recreation therefore the current state of information services with special focus on visually impaired people is reviewed through the public libraries of Vietnam along with the initiatives taken to improve the standard of library services for these people. The practical implementation of the library services are discussed which are provided by the General Sciences Library of Ho Chi Minh City which has taken a leadership role in the provision of services to the visually impaired through support and collaboration with Vietnamese government Ministry of Culture and Information and the other philanthropic organizations (Bac 2005). For the large community of disabled users, a public library can best help to serve the needs and requirements of the people with disabilities. The public library services offered to disabled people in Glasgow, Scotland outlines and describe the challenges faced by the public library to offer the library services to the large and diverse body of disabled users who may need to use any part of the public library system at any time and whose needs must be anticipated. The study reveals that despite the range and number of disabled users, it is possible to offer services that comply with legislation and anticipate the needs of disabled users (Beaton 2005). The recent advances taking place with the improvements in IT-based access technologies for the disabled readers have opened up possibilities for new library services. Therefore a study based on libraries in Scotland provides a descriptive account of past and present professional trends with a particular emphasis on the need to focus on the users rather than the technological aspects related to this area (Joint 2005). Implementation of the new library services for the blind and visually impaired at Public library of Koprivnica presents an innovative approach to social
inclusion and empowerment of a marginalized group in the community. It has a great potential to serve as a role model to other local communities in Croatia. The Public library of Koprivnica, focus the information needs of the print disabled children and youth, enabling them with better access to sources of knowledge, information in general and providing more creative leisure time in the local community (Krajina 2007). There are several factors which affects the information needs of the people with disabilities for example the factors that may affect a visually impaired person’s information behavior are like the presence of other health conditions or disabilities, participants’ understanding of the word “information”, their interactions with information providers, their degree of independence, their acceptance of their own visual impairment as well as their awareness of other visual impairments etc. (Beverley, Bath and Barber 2007). Within the library facility it is easier to identify individuals with disabilities who might need assistance. For example, when a person arrives at the library using a wheelchair for mobility, the librarian has a sense of what types of accommodations the user might need in order to access specific library holdings; when a person make use of a white cane or a service dog as he/she enters the library, the librarian can anticipate the assistance that person will need in order to access the library’s resources; when a person who is deaf writes a note to communicate, the librarian has a clue as how to respond to the query (Burgstahler 2002, p.421).

2.4.2 **Accessible Environment for the Disabled**

There are various obstacles which are faced by the people with disabilities in the access of the various library resources and services. In the library environment, library building, its furniture, various information and learning resources should be easily accessible by all. The term access refers to the physical access, as well as providing aids and appliances to access the information resources and services (Roy and Bandyopadhyay 2009, p.626). The ‘accessibility’ issues are at the forefront of library services as the number of users with disabilities attending colleges or universities continues to increase every year. The librarians need to focus basically on three main areas to concentrate to better meet the needs of the users which are bibliographic instruction, web page design and staff training. Also, the libraries need to focus on providing enhanced service to students with disabilities and understanding different learning styles to improve the quality of library
service to better enable and help the students to conduct their research independently with easier access to information (Carter 2004). Cantor (1996) provides the adaptable approach for the librarians planning the library services and are overwhelmed by assistive technologies through a practical guide. The study provides an approach for choosing accessibility aids that puts high-technology devices into a broader context. The study also focus on the transportation services like book pick-up and delivery services for people who cannot get into the library building is of prime importance as such a service is valuable for people who are terminally ill or whose mobility prevents them from using the library facilities.

The proper planning for library services for people with disabilities helps the libraries to design programs and services to address the specific needs of a growing population of disabled people. The elements of the planning for library services for people with disabilities program developed in Massachusetts focused on including the potential users in the discussion at the time of inclusion of new technology in the library, as "Nothing about me, without me" is a common phrase used within the disability community to describe the need for user input into the development of services that are designed for them (Quezada 2003). There is need to think about the various ways through which libraries and librarians can make the required accommodations to facilities, programs and services to people with disabilities. For example accommodations for people with physical disabilities may include a designated space in parking lots for people with handicapped license plates and parking placards; Wheelchair ramp can be provided along with a push button for electronic doors; sufficient floor space can be allotted for people in wheelchairs to reach ranges of magazines; touch screen computer monitor can be installed or programmable keyboard keys (e.g. Intelli-Keys) can be provided; computer mouse can be replaced with tracking ball or joystick etc. (Cohen 2006, p.64-66). Also, there is need to consider the visually impaired people when planning library services as they want and need the access to the same content as the rest of the society but in an alternative format which is appropriate for their abilities (large print, Braille, Moon, audio, electronic). Librarians need to ensure a hybrid mix which meets their particular needs at any particular time, depending on their abilities and the extent of their disabilities (Owen 2003).
Library and information services that are accessible and inclusive can play an important role in reducing discrimination for deaf people in the society. The librarians need to focus on the barriers faced by the hearing impaired community of the users in the library to list out the valuable suggestions to overcome these barriers to provide ideal library and information service to the disabled people. The barriers which are commonly faced by the deaf people in the libraries includes announcements with no visual indication, background noise, poor lightning and lack of clear written and signed information etc. (Playforth 2004). Hearing loss is a communication disability therefore librarians can make the necessary accommodations for the hearing impaired people to minimize this gap which includes providing clear signage to help direct people, setting up visual alert/warning system, making arrangement of personal portable one-on-one Assistive Listening Device (ALD) amplification system, for use at service desks or on tours, also providing headsets and neck-loops for use with amplification systems and there must be a staff person who is knowledgeable in sign language to handle basic communication needs (for e.g. to answer a reference question) (Cohen 2006, p.70-71). Another important accommodation can be a text telephone for the hearing impaired. The device, known as a teletypewriter (TTY) or telecommunications device for the deaf (TDD), allows users to type and read messages over the telephone lines rather than talk and listen like hearing telephone users. The terms TTY and TDD are often used interchangeably, although some deaf people prefer the term TTY since the device is not strictly for the deaf people but it is used to facilitate communication between deaf and hearing people. TDD-compatible modems can also be added to personal computers to enable them to send and receive TDD calls. The TDD service needs to be promoted as a resource the library owns and the phone number should be plainly displayed on all brochures, newsletters and publicity boards (Quezada 2003, p.45).

One of the characteristics of the person may be impairment, but it is the interaction of that impairment with the environment that produces the handicap situation. For e.g. the user with impaired mobility requiring the use of a wheelchair is not necessarily a handicap until the wheelchair user encounters stairs at the entrance to the library. Blindness is not necessarily a handicap for a user until the information he/she needs is only available in print in the library. These examples illustrate, being a part of the
physical and socio-cultural environment, library can contribute to create a handicap situation and that handicap situation may prevent an individual from being able to use the library and its services. Libraries usually consist of a building or buildings, the collection and access aids like catalogues, bibliographies etc., furniture, equipment, services and staff. Public use computers without adaptive technologies for access to the library’s catalogue or the internet prevent some library patrons from autonomous use of these tools. Web sites and other services that are designed without considering the needs of persons with disabilities serve to isolate this segment of the users and may prevent them from using the library to its full potential. Each of these variables can pose barriers to persons with disabilities (Miller-Gatenby and Chittenden 2000, p.314-15). The survey of academic health sciences libraries conducted in 1995 reported the elimination of physical barriers to the great extent along with the assistance provided in the retrieval of materials from the stacks and photocopy services. Much less attention has been paid to the use of adaptive technology that allows disabled users to search a library's online catalog and databases. The survey results shows that some academic health sciences libraries are making a genuine effort to serve persons with disabilities, some are relying on services provided by other units on their campus and some appear to be neglecting the issue (Nelson 1996). There is an urgent need to design barrier free environment in university libraries by procuring proper equipments, technologies and providing proper infrastructural facilities. Also, the need-based services for the visually disabled needs concentration as the academic library services for these persons are not adequate. In India, some university libraries which have taken steps in this regard and have either established or going to establish Digital Braille and Audio library includes Bharathihar University, Jammu University, University of Delhi, Punjab University, Jawaharlal Nehru University, Lucknow University, Calcutta University (Roy and Bandyopadhyay 2009).

2.4.3 Standards for the People with Disabilities

Standards play an important role in making the product or service accessible to the user community in a detailed and coherent manner. Legislation promotes the existence of the standards and focus on the ‘accessibility’ of the technology or the information. The standards set the technical specifications which tell how this accessibility can be implemented and tested (Ioannidis 2006, p.17). Legislation in many countries creates a
mandatory framework in which people with disabilities need to be accommodated. For example, in the United Kingdom, there is the Disability Discrimination Act (DDA), 1995 and the Special Educational Needs and Disability Act (SENDA), 2001. Similarly, in the United States there is the Americans with Disabilities Act (ADA), 1990 (Davies 2007, p.788) and in India, there is the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. As the librarians naturally have a desire to serve disabled users, a new incentive in this area was created by the Americans with Disabilities Act of 1990 (ADA) which was the first and the initial step taken after the legal interpretation for the people with disabilities. This federal law was designed to insure that persons with disabilities will not face discrimination by any public service organization which includes places such as stores, museums, libraries, arenas and public transportation. In short, nearly every service-providing entity is covered under this law (Wade 2003, p.308). The overall goal of the ADA (1990) is to extend maximum opportunities for full community integration to people with disabilities in both public and private sectors of the society. The law was enacted to provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities (Vierling 2005, p.29).

In many countries all over the world, disabled persons are not able to use libraries because the library authorities are not aware of the need for disabled persons to use the library on equal terms with all other citizens. To highlight this issue, the IFLA Standing Committee of Libraries Serving Disadvantaged Persons (LSDP) presents the checklist which is a practical tool developed for all types of libraries to assess existing levels of accessibility to buildings, services, materials and programs and to enhance accessibility as and when needed. The Checklist focus on three main areas i.e. Physical access, Media formats and Service and communication. Physical access suggests the parking area, the surroundings, the entrance and the whole library should be accessible for persons with different disabilities. Media formats mainly focuses on computers facility for the patrons with disabilities including a variety of technological equipment. Service and communication informs about how to train the entire staff about disabilities to provide a good service. Finally there are suggestions for the libraries, how to cooperate with both disabled persons and organisations for the disabled (Irvall and Nielson 2005). The
general academic library response within the UK was surveyed through a study which gives the valuable overview of the progress made in academic libraries till date on disability issues in the UK and shows that both the legislation combined with the inherent customer service values of the library profession helps to raise the standard of library performance (Pinder 2005). A new Library Act was announced officially on 4th October 2006 in Korea to order all mainstream libraries to have provision for the disabled. The National Library of Korea established a National Library Support Center for the Disabled (NLSCD) under new law to help mainstream libraries to offer effective services to people with disabilities. The NLSCD as a national body plays the central role in integrating people with disabilities into mainstream library services. It is essential to raise awareness of the library services, the information needs and the rights of people with disabilities among library professionals, the general public and the government. The NLSCD of Korea makes use of various methods to raise such awareness in library practitioners by in-house training, seminars, workshops, publications, and promotional materials (Lee 2007).

The standards can be distinguished as the formal (or de jure) standards and the informal (de facto) standards. The ‘de jure’ standards are those which are ‘formalized’ by standards organizations and the ‘de facto’ are the technical solutions which are adopted informally by users due to their usefulness and/or reliability to them. The de facto standards can be further categorized as proprietary standards and open standards. The open standards are those which are outside vendors’ control and developed freely and updated by independent programmers (Ioannidis 2006, p.17-18). The library and information community has adopted a range of standards which facilitates the interchange of library data, promotes the inter-operability of library systems and supports national and international networking of libraries. Adherence to the standards plays an important role in improving access to the information resources in the libraries and on the web (Kavanagh and Skold 2005, p.9). Therefore each library must develop its own standards based on local needs and preferences of the users (Dixon 1996, p.68). There is a need to develop quality standards in libraries which can serve as the common national standard for ‘accessibility’ in the libraries like the standards for the physical accessibility to the libraries, information accessibility and accessibility to the materials (which
includes information in other media than the ordinary printed version like in Braille format or as audio files etc.) and technical aids for the different disability groups in the libraries. Afterwards, every single library in the country can adopt these standards to prepare them to serve the disabled users without any discrimination among all the user community (Wiederholt 2005, p.4). UNESCO and IFLA have issued guidelines to provide equal library services to all including people with disabilities. Governments of India and University Grants Commission have also issued guidelines in this regard (Roy and Bandyopadhyay 2009, p. 626).

Technological advances have enabled people with a wide range of disabilities to use computers and the internet, but there is need to follow some standards in this regard (Mates 2010, p.42) like the Web Accessibility Initiative (WAI) guidelines which are considered the international standard for Web accessibility. An accessible Web can help people with disabilities to participate more actively in the society. The Web offers the opportunity of unprecedented access to information and interaction for the disabled people and moreover, the accessibility barriers to print, audio and visual media can be easily overcome through Web technologies (Ioannidis 2006, p.18). So, librarians can refer to guidelines established by the World Wide Web Consortium (W3C), a well-known sponsor of global web development (Mates 2010, p.42) and the standards setting body of the internet (Kerscher 2001, p.12) to learn how to make web content easily accessible to the people with disabilities as these guidelines mainly focus on the accessibility issues related to the content available through the web.

Libraries serving the people with print disabilities have recognized the challenges and opportunities created by the knowledge society and are trying to cope up this changing environment. Digitization has led to the formation of the DAISY Consortium, a global initiative to manage the transition from analogue to digital library services to print impaired people. Digital formats provides new possibilities to counter the risks of social exclusion of print disabled people and promotes equality in access to information and services (Tank and Frederiksen 2007, p.934). DAISY (Digital Accessible Information System) is the name of a standard and the related technology that has been developed by the DAISY Consortium (Kahlisch 2008, p.153) and was approved as a national standard by the formal standard-setting bodies recognized in the United States, the American
National Standards Institute (ANSI) and the National Information Standards Organization (NISO) (Tank and Frederiksen 2007, p.938). The DAISY Consortium was founded in May 1996 by talking book libraries and has developed the standards and technology for DTB (Digital Talking Books). DTB is a XML based format for accessible multimedia publishing. Books, journals and a lot of other information can be marked up in the DAISY format. By using converting software, it is possible to translate a DAISY document into different accessible formats like Braille, large print or synthetic speech. The standards developed by DAISY Consortium includes DAISY V.1 1996 Standard (Prototype, Proprietary), DAISY V.2.02 2002 Standard (XHTML, talking book with TOC navigation facility) and DAISY V.3 ANSI/NISO Z39.86 2004 Standard (XML, schoolbooks and scientific publications) (Kahlisch 2008, p.154). A sub-set of the DAISY standard was proposed as the National File Format and in 2004 this standard was declared as the “National Instructional Materials Accessibility Standard” (NIMAS) (Ioannidis 2006, p.18) and was incorporated into a new Individuals with Disabilities Education Improvement (IDEA) Act (Tank and Frederiksen 2007, p.939). Today the DAISY standard is widely recognized as the ideal approach for providing navigable and accessible information to the print disabled users. Even users who do not have a print disability may benefit from reading books that use the DAISY standard as they offer an eyes-free reading experience without sacrificing the ability to skim and note passages of particular interest (Tank and Frederiksen 2007, p.938-41).

The studies highlights that the information requirements of the people with disabilities are similar to those without any disability but the libraries are still in the infant stage to meet the needs of the disabled community. Therefore, the goal of the libraries all over the world should be to identify varied information requirements of the disabled users and provide excellent information service to them as most of the above studies reveal that there are insufficient services and facilities available in serving the needs of the people with disabilities in almost all the countries. Libraries need to work hard and reinvent themselves to make the necessary accommodations for the disabled user community in present competitive environment of the society. The various obstacles faced by the different disability groups in the access of the library resources and services need to be recognized and sufficient solutions need to be evolved and implemented in libraries to
overcome these barriers. There are several standards and initiatives addressing the issues of ‘accessibility’ for the disabled which need to be adopted by the libraries to serve the disadvantaged population. The DAISY standard and technology has transformed the conventional world of information into the digital era and will undoubtedly prove to be beneficial in the development of the global library for people with special needs. Over the years, the DAISY standard has proved useful for the people with print disabilities and benefitted them with its best navigation facilities including users without any disability.

2.5 Training Programmes on Disability

The provision of disability awareness training should be made in the libraries to enhance and develop better communication skills between the library staff and the users. The following studies review the importance of training in the libraries, both for the people with disabilities as well as the library staff. This section further emphasize on the importance of orientation and training programmes developed and designed by the libraries for the disabled users to help them to use the library services and resources effectively and efficiently. The importance of ICT related training for the users and the library staff is also highlighted in the study, to familiarize them with the assistive devices and technologies available today in the modern electronic environment.

2.5.1 Role of Training

Training is an essential component of effective service. A major reward in serving patrons with disabilities is finding the solutions that make inaccessible library resources accessible. A library having the latest assistive technology does not guarantee the use of technology to its full potential as all the users with disabilities may not be familiar with assistive technology. Therefore, here training is the link connecting assistive technology to patron use. In simple terms, training is an organized process that helps trainees to learn the skills necessary to perform specific tasks. Effective training empowers library users with disabilities by teaching new ways to access information and knowledge. A major training challenge is to find out what patrons need and want to know which can be done by using interviews, questionnaires, focus groups, and task analysis (Holt and Hole 2003). Professional library services depend largely on the continuous upgrading of staff through training on a regular basis. It could be fortnightly, monthly, or seasonal training.
Special training requirements can be determined by the Library management and training officers depending upon the skills, and training needs of the individuals. The practical training could be held in small groups giving each group an opportunity to work with all types of disabled users (Kishore 1999, p.1-7). A combination of improvements to access technology and adoption of ‘design for all’ principles along with staff and user training have shown the raised awareness and positive results (Brophy and Craven 2007, p.970).

2.5.2 **Staff Training Programmes in Libraries**

“Libraries should provide training opportunities for all library employees and volunteers in order to sensitize them to issues affecting people with disabilities and to teach effective techniques for providing services for users with disabilities and for working with colleagues with disabilities” (American Library Association 2001). The aim of providing disability awareness training is to raise awareness and offer practical advice to the front-line staff so that they could offer the best possible services to the library users with disabilities. Disability awareness training helps the staff to know that, how to communicate with deaf people, what can be done for blind readers or simply which colors of paper can be best for leaflets for dyslexic readers. The effective disability training can be carried out by the libraries, either in-house or by means of outside speakers according to their relevance and videos can also be used to widen the scope of the training. Also, if a training programme is delivered with certain clear, practice oriented values in mind; libraries can significantly upgrade the quality of front-line services delivered to the disabled users (Charles 2005). The online training module can be developed by the libraries to explore the views of library staff on the effectiveness of an online training module in the area of disability awareness and to evaluate the appropriateness of this method of delivery for staff development in an academic library. The suggestions and the opinions of staff on the effectiveness of the training programme can be obtained to know about any increase in participants’ awareness and knowledge of the subject. The online training method assist the library staff to learn more about the information needs and requirements of disabled people and to provide an excellent customer-focused service to all users (Forrest 2007).

Staff development programs dealing with library service to students with disabilities are scarce in school libraries. The school library staff gets very less opportunities to
participate in such staff development programmes that would assist them in teaching, communicating and providing the information to the disabled users. There is need for library-specific staff development programmes for school librarians and their inclusion in briefing sessions on disabled students and in the meetings of students' individual learning support groups when the issue of information resourcing is being discussed. However, school librarians need to ensure they always attend general staff meetings and other forums where information about disabled students may be disseminated (Murray 2000a). School librarians can develop a personal staff development programme or they can work with other school librarians in the same geographical area. There is a requirement for pre-professional courses to cover elements of library service to people with disabilities, so that at least newly qualified staff is prepared to meet the needs of this client group to some extent. Also, staff development programmes that cover policy formulation, collection development and adaptive technology aspects of library services for students with disabilities need to be developed (Murray 2000b). The university is committed to serve the needs of the society by providing the required resources and services to them and library plays an important role in the fulfillment of this mission by offering improved services to students, staff and the community users with disabilities. Therefore, libraries can be awarded some special grants to concentrate on the activities concerning mainly the users with disabilities, to improve the ability of disabled students to conduct library research independently by expanding the library instruction program, to improve library services by increasing the sensitivity and understanding of the library staff towards persons with disabilities and lastly to improve access to information and to enhance the library’s collection to better serve the disabled users (Graubart 1996).

There is a growing recognition of the need for deaf awareness training among library staff as libraries play an important role in providing information to the deaf people as well. There are a variety of training resources available for deaf awareness training with a checklist of good communication skills with deaf community. Librarians need to focus on these training resources on how to improve communication with deaf people i.e. all groups of people with hearing loss. Most of the staff training sessions are limited by some time frame and librarians do not get opportunity to learn a recognized form of sign language therefore they need to be provided with some additional reading
material/booklets to develop the awareness in this area (Forrest 1997). While disability awareness is still an essential training for the library staff but now there is need for staff to know how to use both the hardware and software which their disabled users may require within the library. There can be specialized staff in the library which can be trained fully to get expertise in all the assistive technologies to help the disabled users as and when needed. The assistive aids/devices that provide access to internet and various software packages to users have expanded over the last few years therefore, it is important for the staff to get the training in this area to keep pace (Charles 2005, p.455) with the changing technologies.

2.5.3 Library Training Programmes for the Disabled

In order to create an efficient and effective library programme for the disabled users, libraries need managers who are up-to-date and aware of the latest developments that are likely to have profound effect on their services. It is the collective responsibility of the libraries to promote quality services by gaining a good insight into the problems faced by the disabled. Library staff must recognize that some disabled persons have no control over their behavior and need to be competent enough to handle difficult situations. Users need to be given individual attention so as to understand their strongest communication mode. Therefore, various aspects are essential to develop a model training programme for the disabled which includes training of library staff, developing user assistance schemes and offering special services to the users (Kishore 1997, p.4). The library instruction programme can consist of the course material like guides on how to find books and periodicals, the large Typefont and Braille guides for the users with sight impairments, quick reference sheets on using the adaptive workstations, using the keypad to invoke the speech synthesizer screen reader and printing in large fonts. The guides can be translated into the languages of the majority of users. The information material can be provided to individual user group in the form of packets containing the appropriate language version of the guides, a library glossary, and a guide to using interlibrary loan with the evaluation forms to be filled out at the end of the sessions by the users (Graubart 1996, p.39).

Libraries should also offer the ICT related training to the people with disabilities by giving prime importance to the blind and visually impaired. User feedback on self-reported competencies for online activities and information processing can be taken
through a feedback form. ICT trainings can help the users to overcome the mental and technical ICT barriers and to participate online in educational, social and institutional activities (Puffelen 2009). User training can be organized for the use of the various assistive technologies available in the libraries by the users. For example, JAWS is a powerful screen reading software that provides the user with many options in terms of Web site navigation. It is an extremely complex and expensive software that requires an initial training for its effective use and further training is also required whenever a new version is released. Lack of familiarity with electronic equipment and a lack of support and training in the use of adaptive technologies are also identified as a barrier to accessibility of information (Brophy and Craven 2007, p.955-956). The users with disabilities have varying degrees of need and demands based on the type and the nature of the disability they have. So, libraries should develop a training plan which broadly encompasses the needs of the disabled that can help librarians to become agents of social change (Kishore 1999). The prescriptive training packages are very difficult to compile as there are too many variables to consider like people and their disabilities, different browsers, frequent changes and upgrades to browsers and a variety of adaptive equipment and software. Therefore the content of the training can vary accordingly (Williamson, K. et al. 2000). For example, in a library orientation or training programme organized for the hearing impaired students by the libraries, a sign language interpreter can be hired to sign the librarian’s presentation. For the blind or vision impaired students, separate workstations can be arranged and they can be given instructions on how to scan, read and save a document, how to print a document in Braille and how to access campus e-mail accounts or the library’s OPAC, online periodical indexes etc. The library instruction programme for the disabled users can consist of guide to the library including how to locate and check out materials and how to utilize interlibrary loan and various other library services. The users can be given the opportunity to try out some of the tools (Graubart 1996, p.40) and techniques taught to them.

The above studies focus on the training of the library staff to make proper selection and use of the ICT technologies and services available for the people with disabilities. The library staff act as the representatives of the library therefore they must be well aware of the tools and techniques to serves the disabled community. The staff training programmes
conducted by the libraries helps them to derive the necessary solutions to accommodate the users with disabilities without compromising services to users without any disability. The studies mainly emphasize on the user training on the use of adaptive equipment/devices and to navigate the internet for accessing the material from the online resources to work independently to fulfill their information requirements.

2.6 Assistive Technology for the People with Disabilities

The assistive technology plays an important role in the lives of the people with disabilities as it enhances information access and allows the user to accomplish their tasks in a more refined manner independently. The following section will define the concept of assistive/adaptive technology and its role and importance in the access of information for the people with disabilities in the digital environment. There are thousands of computer based assistive aids and devices available today for the disabled and libraries are using these resources to provide services to their disabled community. The study will discuss the various software/hardware facilities available in the libraries with their significance to the library patrons.

2.6.1 What is Assistive/Adaptive Technology?

The information age has transformed many library activities and brought an entire new group of potential patrons in the libraries which are so called people with disabilities. A properly adapted computer workstation can enhance the ability to access information displayed in digital format. The availability of alternative methods of computer input and output has freed and empowered the disabled population and opened up a new world of knowledge and power for them (Coombs 1999, p.207). Computers in libraries are essential tools and assistive technology is the key to use them for the people with disabilities. Assistive or Adaptive Technology (AT) involves a device or a computer based accommodation that helps an individual with special needs to work around or compensate for a disability and enhancing individual ability (Goddard 2004, p.2). Video magnifiers, electronic readers, optical character recognition software, magnification software, speech output systems and electronic Braille devices etc. all provide a solution for a particular individual with disability and these computer related aids and equipment are commonly known as ‘assistive’, ‘adaptive’, ‘access’, or ‘enabling’ technology. The
combination of these technologies can be used by people to enable them to interact and work in the electronic environment. For example, user can choose speech output system predominantly with Braille output to verify unusual spellings or language. Magnification may be used to explore a page, with speech output to read out more text rich parts of the page. The AT provides various means for a blind or partially sighted person to overcome several barriers such as the need to read print, use of a computer workstation, taking notes and communicating on paper and in electronic settings (Brophy and Craven 2007, p.954-55). In simple words, Assistive technologies refer to products, devices or equipments that are used to maintain, increase or improve the functional capabilities of people with disabilities (Koulikourdi 2008, p.387).

2.6.2 Role of Assistive Technology in Information Access

Assistive technologies play an important role in equalizing opportunities for people with disabilities in several aspects of life as this technology enables them to overcome various limitations and obstacles faced in all types of environments (Koulikourdi 2008, p.387). Accessible technologies can have a remarkable effect on empowering persons with special needs accompanied with the internet that provides great opportunity for connections to a range of people regardless of their location (Baker, Hanson and Myhill 2009, p.48). Access to the information is major problem for the disabled but today ICT along with assistive technologies have helped to reduce the digital divide between sighted and the blind by providing information on their desktop (Koganuramath and Chowkimath 2009, p.619).

There are numerous technologies available today for the individuals with disabilities to help them to access the printed or electronic material available in the libraries. So, there is requirement of highly knowledgeable IT and computing staff for handling this technology and creating innovative ways to apply it. The staff providing the disability services should be well aware of the needs of the students and find solutions to keep pace with emerging technologies (Berkeley, Kressin and Oberlander 2007, p.12). In an educational context, accessibility to the courseware is an issue for the disabled learners. The accessibility of the content can be provided to them via an interface that is compatible with the various enabling (hardware/software) technologies which need to run
in conjunction with the courseware program. The functionality of the interface includes navigation, searching, indexing, bookmarking and note-taking (Vincent 1997).

### 2.6.3 Assistive Technologies in Libraries

In a library, assistive technology may be as simple as a magnifying glass but it can also be sophisticated as a computer workstation with software which facilitate user with disabilities to scan a book and hear it read loud followed with highlighted text on a monitor screen. Similarly, libraries can add workstations configured according to the needs of the specific user groups like provision of speech recognition software for the blind to control the computer or enter the text via their voices, the touch screen monitor and an electronic tracking device for those who cannot make use of standard keyboards. The libraries can create the effective assistive technology programs to find the better solutions for providing the access to the library resources and the services (Goddard 2004). The accessible workstation allows patrons to adjust the height of the worktable and includes a movable arm for mounting the monitor so that user can tilt the display as required. An ergonomic keyboard tray and a large monitor around 20 inches or larger should also be part of the workstation. The larger monitor allows patrons using screen-enlarging software to see more of the displayed text as they move through documents (Mates 2010, p.41). Well planned technological solutions and access points based on the concepts of universal design are essential for the effective use of information and other library services by all the people (American Library Association 2001).

New technology has opened up new areas of participation and activity for people with disabilities that were inaccessible few years ago. It is vital to ensure that users are able to use these enabling technologies apart from their inexperience with the hi-tech aids (Dixon 1996, p.65). Information can be provided to the people with disabilities if libraries can make necessary arrangements to provide their computing environments to them for maximum utilization of electronically published materials, regardless of their abilities. There are many technological innovations taking place for the people with disabilities so librarians need to explore how people with disabilities use computer technology and what are the issues involved in using this technology for accessing the electronic information (Berliss 1994). On the road to making libraries more accessible to people with disabilities, librarians often get stuck in technological mud. The choices are
overwhelming and many librarians feel they lack the technical expertise to select appropriate equipment (Cantor 1996, p.41). Therefore, before implementing new services to the library for the people with disabilities, librarians need to refer to the various bibliographical sources dealing with the problems of providing library services to the disabled and to search the literature for research articles which describes the particular library’s experience with the technological equipments in detail to assist them in their decision-making process (Bekiares 1984).

Library staff should be aware of all the available adaptive technologies which address different disabilities and should know how to assist all users with library technology. The research study investigated the current use of assistive technologies (AT) in Greek libraries and revealed there is lack of AT in Greek libraries and depicted that the current legal and regulatory framework with regard to AT is insufficient. Greek libraries are in an early stage of providing equal and effective services to patrons with disabilities. Several libraries are totally unaware and unfamiliar with concepts such as accessibility and assistive technology issues. This may be due to a number of reasons, like many AT solutions are introduced at a slow pace in Greek market in comparison with other technologically updated countries. Furthermore, they are quite expensive and do not support Greek language in order to fit to the needs of Greek education and culture (Koulikourdi 2008). The area of adaptive technology is growing rapidly and making various assistive software applications available for the computer users with the disabilities which differ and range in functionality from simple to highly specialized, to meet the user’s needs like screen reading software JAWS (Job Access With Speech), OMNI 1000 which provides the ability to scan information from a book, newspaper or magazine and have it read aloud by the screen reader, OMNI 3000 which is geared specifically to those with learning disabilities etc. But, libraries should choose only those technological solutions which are useful in the library setting. If libraries have adaptive technologies, they must advertise the fact as many users are not aware of the services being provided by the libraries for the people with disabilities (Lisiecki 1999). It is not possible for any library to plan for every single patron's needs and selecting, installing and maintaining one or more of the most popular assistive software programs. Therefore, a study highlights five software options for the libraries which can be adopted to provide
the services to the disabled users. The suggested software includes ‘JAWS for Windows’ from Freedom Scientific, ‘Window-Eyes’ screen-reading program with portable application, ‘ZoomText’ magnifier/reader and ‘ZoomText’ keyboard, ‘Dragon Naturally Speaking’ which is a speech-to-text engine that allows users to dictate into Windows-compatible programs, such as Microsoft Word and Outlook and last one is ‘Text Aloud’ which is a text-to-speech (TTS) software. The library staff should also consider adoption of a long-term strategy for planning for patrons with disabilities (McHale 2007).

The assistive technology services in school libraries provide new opportunities for students with disabilities to function more productively in a variety of circumstances as it improves access to information, allowing students with disabilities to independently seek out solutions to meet their own needs. There are thousands of assistive devices available today that can be applied to address a variety of personal needs, for example, users with hearing challenges can make use of various assistive listening devices, captioning features and text telephone (TTY) or telecommunication devices for the deaf (TDD). Users unable to communicate verbally can make use of portable augmentative and alternative communication (AAC) devices to speak for them. These devices allow customized programming to facilitate communication in multiple environments. Users with visual difficulties can make use of portable magnification devices, specialized software with screen reading and magnification capabilities, CCTVs (Closed Circuit Televisions or electronic video magnifiers), audio products i.e. talking books, Braille computer technologies like Braille translation software, refreshable Braille displays and specialized Braille printers like Braille embosser including large print resources (Hopkins 2004). Large print books, books on tape, books on CD, and e-books are all additional options for accessing written information that can meet the needs of certain individuals with low vision. Assistive technologies increases independence in accessing printed information in libraries therefore librarians need to understand how computer based and non-computer based AT can assist individuals with disabilities in accessing printed information (Ethridge 2005). Several other important software programs available for library patrons with blindness or visual impairments includes ‘Duxbury Braille Translator’ (DBT) which is very popular Braille translation program for Microsoft Windows; ‘CakeTalking’, a computer music and sound creation program that is
compatible with SONAR; ‘DocReader’ which is a talking word processor; ‘Reading Bar’ a text-to-speech toolbar for Internet Explorer and it is multi-lingual with capability of translating Web pages; ‘Connect Outloud’, a program that allows users with visual impairments to access the Internet, surf the Web, send and receive e-mail and create documents using the Freedom Scientific word processor; Kurzweil 1000 another text reading software that can read both electronic and printed text that has been scanned into a computer. Text can also be modified, saved, signed or printed by the user. The software includes a calendar application, dictionary, thesaurus and spell checker (Sunrich and Green 2006).

There are many special considerations which need to be made for libraries to meet the claims of equality of opportunity to all the user community. A study of libraries in the north-west of England presents their service provision to deaf and hard of hearing people with the material and technological developments such as loop systems, minicoms (text telephones), building adaptations, computer and videophone service facilities. It examines the potential of these technologies in revolutionizing the approach of deaf people in acquiring information. The considerations should be made whether the specialized equipments are used effectively by the users or not as new technology can prove beneficial for the society only when they are ready to accept that technology (Jeal, Roper and Ansell 1996). In India, “M. K. Tata Memorial Learning Centre for Visually Challenged Students” has been set up at Sir Dorabji Tata Memorial Library, TISS in 2008 to provide innovative teaching techniques and philosophy that continues to have far-reaching effects on the lives of visually challenged and taking them to new heights of independence. The Centre has acquired latest technologies to assist visually impaired readers and presents a successful case to illustrate how best the university library’s information resources and services could be extended to its disabled user community (Koganurmath and Chowkimath 2009). Similarly, the other libraries in India and abroad can take various initiatives to provide the similar opportunities to the people with disabilities across the country to empower them to play self-sufficient and active part in the society.

The studies reveal that the adaptive technology greatly enhance and improves the information access for the disabled but the selection of appropriate adaptive/assistive
technology for the libraries among the thousands of resources available today is an issue of great challenge for the librarians. Therefore, librarians should make necessary considerations before adopting these technologies into their system by deeply examining the available research literature in the area and gaining knowledge through the experiences of the other libraries. Due to the high cost and complex nature of some assistive aids/devices, the library staff should be trained regarding particular technology before providing services to the users. The Librarians have power to minimize the gaps between the people with disabilities and the technologies as now special hardware and software are available to accommodate almost all types of disabilities to help the disabled to realize their potential and to make use of all the facilities of the library.

2.7 Web Access for the People with Disabilities

The access to the Web-based information has provided many benefits to the people with disabilities in comparison with printed resources and services. Users can interact effectively to the electronic environment with the help of the assistive technology available to assist them. The access to web applications is becoming an important issue for the people with disabilities, therefore the following section will focus on the studies which discuss and emphasize on the accessible web design for the disabled to access and use the various online resources and services. The importance of web-based resources and services along with their impact on the disabled population is also reviewed. The barriers faced by people with disabilities due to inaccessible web design are also addressed in the study along with some suggestions to overcome these digital barriers.

2.7.1 Accessible Web Design for the People with Disabilities

The World Wide Web (WWW) has been around for more than a decade providing access to thousands of web applications to its users. But despite of the web accessibility standards available today along with the disability discrimination legislation in many Western countries, still much of the web remains inaccessible to disabled population (Adam and Kreps 2009, p.1041). The reason behind this inaccessibility is the severe lack of awareness about accessible Web design issues among the Web developers, companies and institutions that purchase the Web-based products (Byerley and Chambers 2002, p.169). Web accessibility generally refers to the application of technical solutions to the
design of the Web to make it more accessible, particularly to the disabled users. The accessibility of Web-based information for the disabled can be improved through the use of access technology and through adopting good practice in interface design. For e.g. the assistive/adaptive equipment enables a visually impaired user to access on-screen information. However, if the information provided on screen can be interpreted by any kind of access technology then it is referred to as ‘accessible Web design’, ‘design for all’, or ‘universal design’. In a library environment ‘Design for all’ means that a library’s information technology systems and interfaces are designed in such a way that it can be read and interacted easily by all users of the library, whether they are visiting the library or accessing it remotely, regardless of any disability or access preference of the users (Brophy and Craven 2007, p.950-56). A universal Web design will greatly reduce the cost of assistive technologies geared specifically to individual computer workstations. Thereby, a universal Web design will surely prove beneficial for the disabled community as a whole rather than achieving accessibility through a segregated, compartmentalized and ad-hoc approach. An accessible Web design enables people with low-end browsers, slow modems and narrow bandwidth to access the Web and to participate fully in the Web environment (Yu 2002, p.417). Web accessibility generally emphasizes on making websites accessible to persons with disabilities and removing potential barriers to access caused by inconsiderate website designs. Today many services are available or offered at a discounted rate over the internet. Hence, if a website does not meet a basic level of accessibility then it will be impossible for the thousand of potential users who have a disability to use these services (Curran, Walters and Robinson 2007, p.450).

Access to electronic resources and services has been enhanced through Web based interfaces in the libraries. Library Web sites have evolved into information gateways providing access to various library services and resources including electronic databases, library catalogs, research tools and the Internet (Yu 2002, p.406). The shift towards the graphical user interfaces and complex Web design has placed the barriers to the information access for the disabled people (Horwath 2002, p.199). In an early study of 1990s, the development of the Graphical User Interface (GUI) was examined to know whether it is ‘tamed’ for use to the people with visual disabilities. All of the developments during this period followed the same progression and developed the visual
GUI initially but when need was felt about the accessibility for the users with visual disabilities then some form of adaptation was added to the existing interface. The study focused on past efforts to adopt GUIs for use by non-sighted persons (Edwards 1996). The people with disabilities especially the vision impaired face many access problems with the internet as Web page designers ignore the disabled people while testing the accessibility of their designs. The inaccessible design results in reduced access to the internet facilities for the disabled which can improve the quality of their life. Therefore, it is necessary to develop a special human computer interface (HCI) system for vision impaired people so that they can browse the World Wide Web via Internet. A knowledge-based HCI system can have a substantial impact on reducing the digital divide with broader access to Internet services to the disabled users (Loo, Lu and Bloor 2003). Today search engines are the significant tools to surf the Internet. Therefore, through a study Oppenheim and Selby (1999) looks at how the three search engines, AltaVista, Yahoo! and Infoseek presents the information to the visually impaired and blind users and how much accessible individual Internet pages are. Users were asked for feedback on interface design at various stages of their search along with any problem encountered during the process. Again, web page designers were found responsible for the barriers to information access due to the insufficient thought given by them during the webpage design. Internet use by the visually impaired is increasing and they are becoming more reliant on the internet for the dissemination of information. Web designers are using different access technology like Java Appletts, JavaScript and plug-ins that are inaccessible to screen readers. This type of access tool should be avoided, but if required for the design of the web page then other alternative access should be provided. Hence, there are many solutions available for the website designers to improve the web accessibility for the vision impaired using sound and tactile displays (Walsh 2006) which need to be taken into consideration by them. The major features that are of importance in webpage design for the blind and vision impaired includes the use of HTML code standards, as extensions to the HTML standard cannot be validated and makes Braille translation very difficult. The page design and navigation should be simple, consistent and clear throughout the site. A text index or site map should be available to direct users to relevant pages. Use less graphics and all images should be accompanied by alternative
text (Alt-Text) which describes the image in a short sentence to enable Braille or speech synthesis to relate to the user the content of that image. The use of italics text should be avoided as this can appear ‘wobbly’ on screen. Also, the use of frames on a site should be avoided as some access devices cannot read the information held in frames and if frames are used, a text alternative should be provided (Oppenheim and Selby 1999, p.337-38).

People with disabilities require assistive technologies to assist them in the access to the digital content available on the web. The transition of library indexes and databases to the online environment has created unprecedented opportunities for people with print disabilities. Assistive devices such as modified computer keyboards, audio web browsers and screen readers with speech or Braille output which provides access to electronic text depends on the design of the web environment for a good response. Even the most advanced assistive devices cannot overcome the barriers associated with inaccessible design. When librarians fail to select accessible resources, “true” disability, with all its negative ramifications is created (Stewart and Narendra 2005, p.266). In a particular study conducted to explore how blind people navigate and interpret layouts of news and shopping Web pages using current assistive technology, it was found that blind people do not parse Web pages fully during their first visit and can miss important parts as many Web pages (e.g. news) change often. This suggests that screen readers would support users better if they could identify and present the important sections first (Revilla and Crow 2010). In another study, the accessibility of three aggregator databases, EBSCOhost, InfoTrac and First Search Electronic Collections Online (ECO), was analyzed with the application of assistive softwares for compliance with the Web accessibility guidelines published by the WAI of the W3C. The softwares used with each database were JAWS for Windows 3.7, OpenBook 5.0, ZoomText 7.0, Kurzweil 1000 and Kurzweil 3000. None of the databases tested offers a perfect accessibility option for the people with visual impairment and only EBSCOhost provides an option for the disabled clients and FirstSearch provides different language options. JAWS for Windows 3.7 proved to be best for the blind and ZoomText 7.0 proved to be a viable alternative for the users who needs screen magnification. This shows that aggregator databases do not follow the accessibility guidelines and are unable to supply accessible products (Riley 2002). Another library database accessibility study evaluated 32 most commonly
subscribed academic library databases and measured their accessibility to users of adaptive technology. A TAC (Tatomir Accessibility Checklist) of accessible features was developed to test the extent to which features have been incorporated into the major databases. It was found that nearly 72 per cent of the databases studied were marginally accessible or inaccessible and the accessibility features in some databases like in PubMed and Health Reference Center Academic, do not offer the user with the same affordances as to the mainstream users (Tatomir and Durrance 2010).

Although, to some extent the ability to access Web-based information can be enhanced and achieved through the application of the proper assistive technology, but assistive technology alone cannot overcome the barriers posed by inaccessible web design. The study of web accessibility undertaken at the 24 most highly ranked schools of library and information science (SLIS) of the American universities, found low Web page accessibility at the nation's leading library schools. This reflects a lack of awareness about the issue among the leaders and trainers in the library profession (Schmetzke 2001). So, there is need for librarians to focus on how persons with disabilities access Web-based content and evaluates the challenge of Web design. The resources exist to assist the library professionals to obtain and evaluate the product accessibility information from vendors. Librarians can best serve these patrons with disabilities by proactively updating and adapting services as assistive technologies improve. Libraries should try to explore the current standards that offer recommendations for accessibility of the web resources including internet resources, subscribed databases and a library website (Vandenbark 2010). Also, through a particular study it was found that evaluation of homepage is not sufficient to detect the accessibility of the website although it is a representative of the whole site with respect to accessibility (Hackett and Parmanto 2009). The documents which are considered authoritative and provide comprehensive guidelines for the design of accessible web sites includes the Web Content Accessibility Guidelines (WCAG) issued by the Worldwide Web’s, Web Accessibility Initiative (W3C/WAI) and the federal access board standards issued under Section 508 of the Rehabilitation Act of 1964 which was amended later in 1998 (Stewart and Narendra 2005, p.266).
2.7.2 Impact of Web-based Resources

The advent of the World Wide Web (WWW) and its resources has caused a dramatic evolution in academic libraries (Byerley and Chambers 2002, p.169). The applications of the computer technology particularly the Internet have a strong impact on the environment of the libraries. The print-based information has been substituted with its digital equivalent. The Web provides the main channel for the dissemination of variety of educational resources like official Web pages with administrative information, various course materials, online tutorials and Web-mediated distance education programs etc. Libraries are most affected due to the digital revolution, with a great responsibility to store, organize and provide access to the wide variety of electronic information (Schmetzke 2001, p.35-36). The main challenge for technology librarians is to be proactive in keeping them update and abreast of technological advances and learn from their efforts to provide Web based information and services to patrons of all kinds (Vandenbark 2010, p.28). “Advances in technology and use of the web have provided more choices in the delivery and access to information and resources” (Craven and Booth 2006, p.179). Today libraries and their users rely heavily on electronic resources and databases for their information needs and requirements therefore it is essential that these resources be made accessible to users with disabilities along with other materials. Library web sites are the digital front door to library services as they reflect the priority libraries give to their services (Power and LeBeau 2009, p.55-56). Therefore, today mainly three types of Web-based resources are offered by the libraries to its user community which are access to the Internet, access to subscription databases and a library’s own webpage/website, all of which need to be accessible to the people with disabilities (Vandenbark 2010, p.26).

When an individual with a disability uses the Internet, other users do not know that the person has a disability. Hence, in an Internet based study, the role of the internet and its usage on the level of perceived independence among people with physical disabilities was examined. The measures adopted for use of the Internet included the number of hours spent online per week and the number of Internet services used by the participant. The services include email, the World Wide Web (or WWW), Telnet and File Transfer Protocol (or FTP). It was found that an increase in the number of Internet services used
had a positive influence on the perceived level of independence among individuals with physical disabilities. The usage of the World Wide Web and Telnet mainly benefits independence (Grimaldi and Goette 1999). The Internet is assuming an increasingly central role in our society therefore access to the virtual realm is becoming equally important. The access to the internet and its resources newly defines the distinction between the ‘haves’ and ‘have-nots’ in our society. The current thrust for online accessibility focuses mainly on Web pages, the accessibility of other Web-based resources for which institutional Web pages function as gateways and constitutes the major components of the larger educational online environment. As the Libraries’ primary task is to meet the information needs of all the users therefore librarians should aim to bridge the current information gap concerning the accessibility of the various electronic resources for the people with disabilities to navigate the online environment on equal terms with those without any disability (Schmetzke 2002). In the study based on ICT for access to information services for disabled people, it was found that providing access to information for all users, irrespective of their physical disabilities is a requirement for all libraries and ICT can be used to assist this. The study describes a range of projects and services that have been developed by Gateshead libraries using ICT to provide a gateway to the wealth of information available in digital format (Myhill 2002). The best resource for facilitating direct access to digital information for the blind users can be ‘eBraille’ which is a web-based translation program converting Japanese text into braille documents easily. Moreover, it is a free system for creating braille text files for anyone who has access to a web browser. When eBraille translation accuracy was evaluated, it was found that it is equivalent to or better than the other standalone braille translation programs and achieved the goal of being applicable for practical use (Sugano et al. 2010).

The accessibility of the two popular Web-based abstracting and indexing services, Proquest’s Periodical abstracts provided through OCLC FirstSearch and Gale Group’s Expanded Academic Index ASAP was examined, when accessed by blind users using screen reading programs i.e. JAWS for Windows 3.7 and WindowEyes 4.1. It was found that, while each database has a high degree of accessibility, there is a need for Web developers to conduct usability testing of commercial databases with people who rely on
screen readers for access to the web. It is not feasible for the librarians to test the accessibility of every online product they are considering for purchase therefore librarians must be at least aware of accessibility issues and should demand assurance from database vendors that their products are accessible (Byerley and Chambers 2002). In another study, the accessibility of four Web-based proprietary databases offered by many public and academic libraries was evaluated which included EBSCOhost MasterFile Elite, Electric Library Plus, Encyclopaedia Britannica Online and The Oxford English Dictionary Online. The survey respondents consist of the computer users who were blind or visually impaired and were comfortable in using the World Wide Web. Not a single database clearly emerged as completely accessible on all levels but the Encyclopaedia Britannica Online and EBSCOhost MasterFile Elite was found to be the most accessible than the other databases. The largest factor affecting ease of use and accessibility was the design of the resources themselves. The design elements that made the databases difficult to use and should be considered when evaluating online resources for inclusion in a library’s collection includes the illogical placement of the links, buttons or edit boxes on the screen, inadequate labels on the links, use of frames etc. (Horwath 2002). Also, through a particular study, the impact of the library databases on students with print disabilities was studied who use screen reading technologies to navigate the online resources. Users performed the online searches to complete the series of tasks in three different online databases (CBCA Complete, Sociological Abstracts and Expanded Academic ASAP). Users rated Expanded Academic ASAP and Sociological Abstracts as difficult while using their screen reader to read the full text articles. The articles in PDFs were inaccessible as the PDFs were image based and were not tagged for screen readers. The amount of links on the result page in all three databases also posed a barrier and interfered with the screen readers (Dermody and Majekodonmi 2011).

In a study of websites accessibility for the disabled, a sample of 33 academic library web sites were examined to study how many websites offered access to text-only versions of the databases and emphasized this access for visually impaired users. The study focused on how well academic library websites guide visually impaired people in the use of the eight larger databases including EBSCO, JSTOR, Ovid, Proquest etc. using two screen reading programs, JAWS (version 7.0) and WindowEyes (version 5.5). Results showed
that only 5 of 33 libraries mentioned database accessibility in any way on their websites (Power and LeBeau 2009). Similarly, the information content of websites developed by and for the people with learning disabilities around the theme of ‘transition from school to adulthood’ was examined through a study. The content analysis approach was adopted in which subject experts/peers evaluated user-generated content produced as part of a project on inclusion and people with learning disabilities. It was found that despite only one theme of a number pertaining to transition; leisure, entertainment and hobby-related information dominated the web sites. The practice of creating and uploading information on the website holds benefits to the creator beyond mere information provision. The development of information services for people with learning disabilities by the service users themselves proved to be an important innovation (Williams 2008).

2.7.3 Problems and recommended solutions to Web access

The World Wide Web has become a vital part of the social infrastructure but from information seeking perspective, it is still a complex information seeking environment. Information seekers in the WWW need to switch and coordinate with different information seeking strategies such as browsing, scanning, query-based searching, etc. The multimedia and hypertext nature of the WWW has changed the way people seek for information and causes disorientation and cognitive overhead problems. People with disabilities and particularly blind users can avail invaluable benefits through web-based services such as on-line shopping, web banking, news and public services but it seems to be difficult for them to use these services effectively and efficiently (Kouroupetroglou, Salampasis and Manitsaris 2008, p.200). The range of situations exists in which disabled people finds problem during web access. Visually impaired people generally use speech synthesis software that reads out the text on web pages, screen readers and voice browsers to surf the web. But the correct, accessible coding of web pages is crucial if these assistive technologies need to make compatibility to their listeners. For e.g. A blind accountant requires properly coded data tables, so that the screen reader will read out the headers of each row and column before the contents of each cell of the table. But it is not only the visually impaired who face the problems accessing the web, a deaf student also needs text captions accompanying audio in multimedia files being accessed by other students. A dyslexic school pupil will need web pages whose presentation is controlled
by an external cascading style sheet that can be swapped for a more suitable one on their own hard-drive. The Web acts as a central component in the provision of a range of services therefore legislation promotes its use for the social inclusion of disabled people (Adam and Kreps 2006).

The increasing provision of Web-based information resources has moved from a simple text interface to dynamic and interactive designs. This has led to the more creative and flexible experience but the problem is that people with disabilities are excluded as they cannot use standard methods of access and particularly people who are blind or visually impaired are most at risk of being excluded from access who use assistive technologies such as screen readers. It has been found that despite a growing awareness of Web accessibility issues, people are still experiencing barriers to access. Problems using FLASH, JAVA Script and PDF are usually cited by users particularly those using screen reading technologies, other one is navigational problem that occurs due to a lack of understanding of the different ways users interact with and navigate Web-based resources. Also, in many cases Web designers mainly emphasize on the promotion of a particular product or service than its usability or accessibility, ignoring the results of accessibility and usability research (Brophy and Craven 2007). When the navigation strategies of the blind and partially sighted computer users were identified including the perceptions of page layout and graphics to identify the challenges faced by the visually impaired community when accessing the Web with current assistive technologies. It was found that current assistive technologies impose navigational constraints and provide limited information on web page layout. The extraneous information such as repetitive links and images present in major purchasing and entertainment sites were found difficult to negotiate using a screen reader. Advanced users expressed the desire for more information concerning graphics (extra tagging, resizing option, and option for minimizing images), multimedia files and scripting which were not currently handled through screen readers such as JAWS (Murphy et al. 2008). Although it is quite easy for able-bodied users to use the web but there are lots of problems for people with disabilities when navigating the web for the information seeking tasks. To solve this problem, the Browsing Shortcuts (BSs) mechanism can be introduced to enable blind people to move efficiently to various elements of a web page like functional elements such as forms,
navigational aids, etc. BSs is an interaction mechanism which facilitates blind people to move efficiently to various semantic, content, navigational or functional elements of a web page during the information seeking process, hence operating effectively as a vital counterbalance to low accessibility (Kouroupetroglou, Salampasis and Manitsaris 2008).

Some features designed to be appealing to the sighted user, makes the Internet pages inaccessible to a visually impaired user which includes the issue of screen design, the use of font size, color, the use of patterns in screen backgrounds that make the text difficult to read and an excess of graphics. Other barriers that prevent access to the Internet include the interface design and the interpretation of speech synthesis to convey the content of the page. These obstacles can largely be overcome with a little forethought in the design process. Guidelines for accessible design and accessibility checkers are freely available on the Internet, but designers are more concerned with the ‘look’ of the page to sighted people than accessibility to a minority of users (Oppenheim and Selby 1999, p.335-43). If information is to be conveyed through color, sound or image, an alternative description should be placed in the html file. The alternative description can then be read by a ‘Screen Reader’ for people with disabilities. Row and column headings should be used to give direction to users if tables are used in the Web pages (Loo, Lu and Bloor 2003, p.576). The designers and developers of online learning materials can incorporate assistive technologies and universal design to make online materials more accessible to the disabled learners. The use of images such as pictures, graphics, banners, flash animations, movies, navigational buttons and some types of PDFs, tables and charts can be avoided during the development of the learning materials for the blind as the screen readers can only read text. The use of ‘layout tables’ should be minimized as it helps the screen-reading device to read the entire text without any interruption. An online learner who is hearing impaired or is completely deaf should be provided access to the audio information available to non-disabled learners. In this regard, designers should provide real-time text captioning for all audio, video and multi-media presentations placed on learning web sites. The printed text transcripts of audio content on the website can be offered provided that the text version does not violate copyright protections (Crow 2008, p.51-52). Deaf people need sign language on the web to have full and barrier free access to acoustic and written content. Sign language videos with human interpreters can prove
to be common solution to bring sign language on the web. SL-videos present preselected web content translated into sign language by a human interpreter preferably a native signer i.e. a deaf person itself fixed on video. The best example in this regard is the German information and e-learning portal ‘Vibelle’ which adapts navigation on the special needs of the deaf via SL-videos. All content of this web site is provided as text and in German sign language. Navigation is video-based and structured spatially with each subject enclosed visually by a different color and made clear with a short SL-sequence. An automatic translation based on avatar-technology can overcome the limits of sign-language-videos, but the possibilities of this solution are still restricted. The international Web Content Accessibility Guidelines 2.0 (WCAG 2.0) need to show consideration for the special needs of the deaf and should recognize the demand for sign language (SL) on the web (Mobus 2010).

The inaccessible web design causes unnecessary problems to certain website users. The compliance of a selection of websites was assessed through a study with guidelines set out by the Web Accessibility Initiative (WAI). It was found that most sites evaluated were inaccessible to those with disabilities and only one of the selected sites passed all three priority levels set out by the WAI. The web content accessibility guidelines can probably increase the amount of possible users who can successfully view the content of the websites including the disabled and the older adult categories of online users (Curran, Walters and Robinson 2007). In a particular study, the impact of inaccessible web design is viewed from the perspective of a librarian who is legally blind. It describes the experiences of a librarian using computers and the internet with screen reading and screen-enlarging software and explains the impact of constantly changing internet technology and inaccessible web design on the efficiency with which the librarian assists the users. The study presents real-life examples of the obstacles that inaccessible web design has presented to the librarian and to the patrons who are blind or visually impaired, and offers suggestions to help librarians make their own libraries websites accessible (Lewis and Klauber 2002). The problems of inaccessibility are further compounded by a reliance on automatic checkers, which cannot possibly verify the accessibility of a web site without a human check for example, Bobby now renamed as WebExact (Adam and Kreps 2006, p.209-10) is one of the well known software
developed by a non-profit organization called the Center for Applied Special Technology (CAST) which can check the webpage accessibility problems. Users can submit a Web page to Bobby by typing the URL of the page at CAST’s Web site. Bobby then examines the page and report accessibility problems. This method will only check one page at a time in order to keep the server available to all. A downloadable version of Bobby which can check Web pages in a whole Website in batch mode is also available. The Web designer earns the right to display a Bobby icon on their Web page if it passes the Bobby test (Loo, Lu and Bloor 2003, p.577). Putting awareness into practice is a growing concern for some resource providers and designers who may be aware of accessibility recommendations but are not necessarily sure how to implement them. Therefore, the methods and findings of two research projects were explored for user behavior and usability issues relating to the use of Web-based resources by people with disabilities. Both the studies provided the evidence of the problems faced by disabled users when using Web based resources. The evidence also revealed the information about the types of features preferred by the users and how they overcome navigational problems and what types of features enhanced their experience. This information can be further fed back into recommendations for the design of electronic resources. The richness of the data collected for both studies confirmed the importance of involving users in accessibility and usability assessments (Craven and Booth 2006).

It can be clearly noticed from the above studies that today there is growing concern on the issue of accessibility in the community of librarians, web developers and the people with disabilities. There is an urgent need to follow the significant laws and guidelines developed for the accessible web design for the disabled patrons of the library. Disabled users depend very much on the web for the most of their information needs and requirements. Therefore, the impact of web based resources need to be evaluated through the user-focused studies based on the user’s preferences and the information seeking behavior of the users in an academic and research environment for completing their tasks successfully. Also, there are several barriers faced by the users with disabilities during the interaction with the Web, which need to taken into consideration by the content developers of the Web to provide necessary solutions to them.
2.8 **Conclusion**

The reviewed studies reveal that today libraries are overwhelmed with the tasks of service delivery to all its patrons including people with disabilities. In this digital age, librarians need to work hard to cope up with the changing technologies and to meet the challenge of serving the disabled users effectively with the adoption of appropriate assistive aids/devices in the libraries. It has been noticed from the above studies that the rising complexity of the technologies and lack of expertise among the librarians to handle these devices is giving rise to the digital divide which further leads to disability divide in the potential users of the libraries. The digital technology, for e.g. Internet can have a strong impact on the lives of the people with disabilities if they have access to the relevant information and resources with the help of the appropriate software and hardware available today to assist them. Therefore, the necessary ICT skills need to be developed by the libraries among the users to facilitate access to information with the help of assistive technologies by providing regular trainings and orientation programmes including seminars and practical workshops on enabling technologies. There are various information resources for the people with disabilities which are available and accessible in electronic environment which makes them feel free from the bondage of the printed world. In the digital arena, there is need to advertise the information resources in the libraries available through the databases, websites and online catalog of the library as sometimes users are unaware of the facilities and services provided by the libraries to the specially-abled population. The concept of ‘Marketing’ of library’s information services and resources is found missing in the reviewed studies which can play a major role in increasing the awareness about the Assistive technologies and services among the users with disabilities.

The several studies conducted in many countries to study the status of the library services provided to the disabled users revealed that most of the libraries are not in a position to serve the information needs of these people due to lack of sufficient AT devices and technical barriers to handle these devices by the librarians and the users. Therefore, before providing the services to the users, the librarians must be trained to handle the various assistive technologies and should learn to communicate with the different types of the disabled people. Studies depicts that some libraries are not concerned at all
regarding the needs of such user group and providing negligence amount of services to them. The studies shows that few Public libraries in some countries have started working towards the goal of providing equal access to their services to all the users with special focus on the people with disabilities and started new ubiquitous services for them with the help of IT technologies which can be accessed free of cost anytime, anywhere regardless the location of the library for e.g. Internet access and download facility through mobile phones etc. Studies based on the role of libraries for the people with disabilities in meeting the information needs of the disabled in digital environment are found totally missing in India as only a single study has been identified so far by (Roy and Bandyopadhyay 2009) just highlighting the initiative taken by some university libraries of India in the establishment of the Digital Braille and Audio library for the users with disabilities. Also, it can be clearly seen that there are many research studies focusing on the information needs of the Blind or vision impaired people and to some extent on the deaf and hard of hearing but other types of disabilities are least covered or not highlighted at all.

Also, the studies states that libraries can transform the lives of the disabled people by providing them access to the wealth of information and knowledge by proper planning before implementing the new ICT infrastructure, facilities and services in the libraries and by following the necessary standards based on ‘accessibility’. As we are living in the digital age, the importance of DAISY technology (i.e. developed by the DAISY Consortium of more than 20 full members and 55 associate member countries) cannot be ignored in the libraries which can help the libraries world-wide to tackle the several technical issues in the access and share of the information and resources among the libraries in universal globally accepted format. Finally, the reviewed survey studies shows that access to the web resources can have positive outcomes in the lives of the disabled people therefore the web or content developers should take into consideration the problems experienced by individuals with disabilities and the limitations that coincide with their use of computer-related assistive technologies. There are several standards developed on the ‘Web Accessibility’ by the W3C especially for the people with disabilities which can be followed before the design of the Web. Also, the Web Accessibility Guidelines should try to recognize the needs of the deaf and hearing
impaired people and consider their needs of sign language on the web otherwise they will be left behind from the today’s information society. Every country has its own national sign language with their own set of linguistic rules therefore according to Mobus (2010), the Sign Language (SL) videos can prove to be a common solution to deaf people to connect and communicate online with their deaf community world-wide.
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