

An Accessible Society through Technology

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Introduction:

This article will cover the definition of terms used in accessibility and disability. In terms of accessible society, the focus will be more on the use of technology (assistive technology) and how it helps create a more accessible world for the disabled not just in the physical world but also in the world of technology (World Wide Web, Information and Communication Technology (ICT), computing and etc.).

What is Accessibility?

Accessibility refers to the design of products, devices, services, or environments for people with disabilities. The concept of accessible design ensures both direct access i.e. unassisted and indirect access meaning compatibility with a person's [assistive technology](#) i.e. example, computer [screen readers](#).

Accessibility can be viewed as the ability to access and benefit from some system or entity. The concept focuses on enabling access for people with disabilities, or special needs, or enabling access through the use of [assistive technology](#); however, research and development in accessibility brings benefits to everyone.

Accessibility is different from [usability](#), where it is the extent to which a product i.e. device, service, or environment, can be used to achieve specific goals by specific users with effectiveness, efficiency and satisfaction.

Accessibility is also strongly related to [universal design](#). Universal design is the process of creating products that are usable by people with the widest possible range of abilities, operating within the widest possible range of situations. Universal design is actually providing something which can be accessed by anybody either able bodied or disabled individuals.

What is Disability?

Disability is the consequence of an impairment that may be physical, cognitive, mental, sensory, emotional, developmental, or a combination of 2 or more of the mentioned impairments. A disability may be present from birth, or occur during a person's lifetime.

Disability is an umbrella term, covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Thus,

disability is a complex phenomenon, reflecting an interaction between features of a person's body and features of the society in which he or she lives.— [World Health Organization, Disabilities](#)

A person may also be considered disabled if they have had impairment in the past or are seen as disabled based on a personal or group [standard](#) or [norm](#). Such impairments may include physical, sensory, and cognitive or developmental disabilities. Mental disorders - also known as psychiatric or psychosocial disability - and various types of chronic disease may also qualify as disabilities.

Some advocates object to describing certain conditions - notably deafness and autism - as disabilities, arguing that it is more appropriate to consider them developmental differences that have been unfairly stigmatized by society. Others argue that disability is a result of exclusion from mainstream society and not because of impairment.

1. Types of Designs for Accessible Society

Many terms have surfaced in recently that describe similar opinion on distinct design concepts. The terms accessible design, usable design, and universal design are all approaches to design that can result in products that are accessible to everybody, including individuals with disabilities. These concepts apply to design of the built environment, of customer services, and the other products and environments, including information technologies such as hardware, software, multimedia, distance learning courses, websites, curriculum, and instruction.

1.1. Accessible Design

Accessible design is a design process in which the needs of people with disabilities are specifically considered. Accessibility sometimes refers to the characteristic that products, services, and facilities can be independently used by people with a variety of disabilities. Accessibility as a design concern has a long history, but public awareness about accessibility increased with the passage of legislation such as the Americans with Disabilities Act (ADA), which mandated that public facilities and services to be fully accessible to people with disabilities.

The Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C) has also developed guidelines and comprehensive resources for designing accessible web pages.

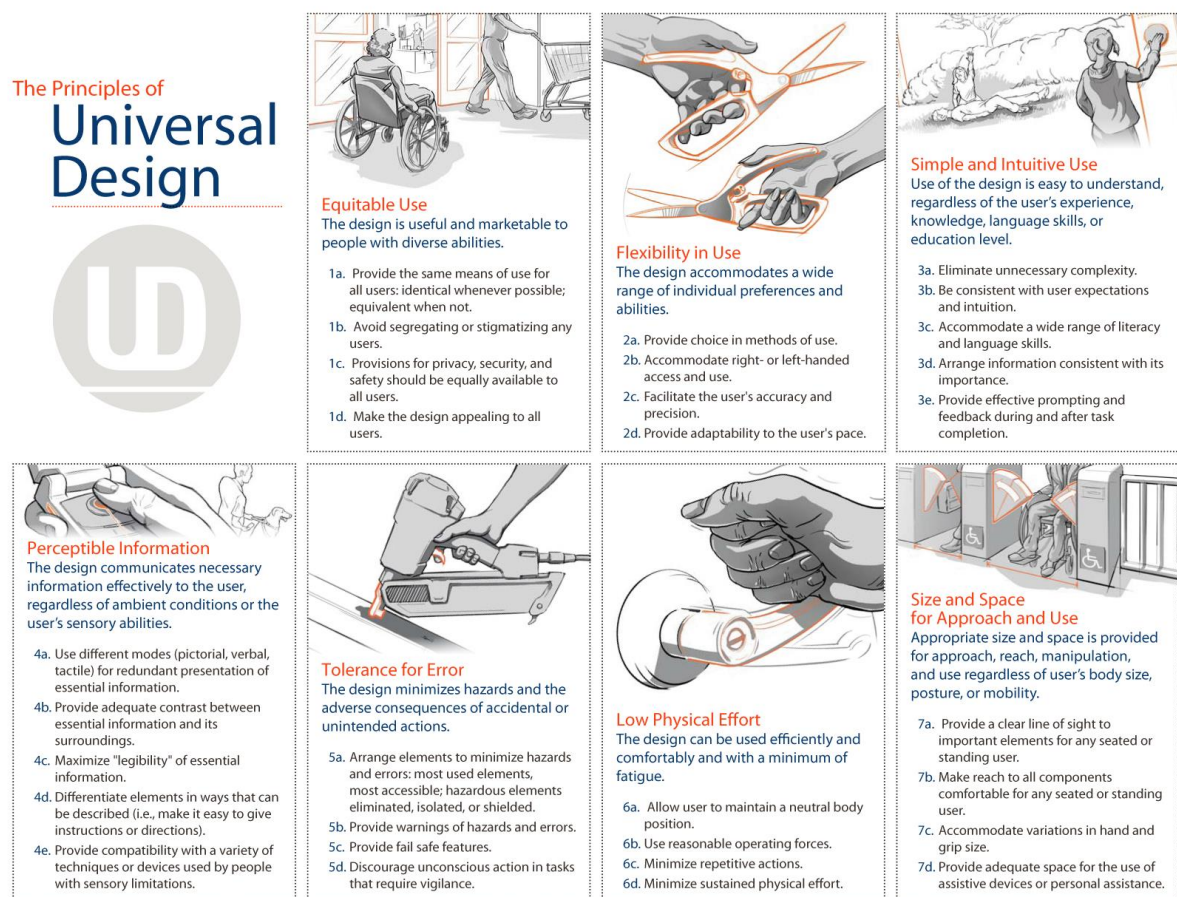
1.2. Universal Design

Universal design is a broader concept that is defined by The Center for Universal Design at North Carolina State University as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design."

For instance, sidewalks with curb cuts and doors that automatically open when a person moves near them are examples of universally designed products. These products not just benefit people with disabilities, but also parents with baby strollers, delivery workers, and others. Human characteristics considered in universal designs may include age, gender, stature, race/ethnicity, culture, native language and learning preference. Another example is road signs / signage / instructions that are understood by all, which in some countries are lacking, including Japan.

In the case of Information Communication and Technology (ICTs), products that are universally designed are accessible to and usable by people with a wide variety of characteristics, including different types of disabilities. These products are often designed to eliminate or minimize the need for assistive technologies. At the same time, they are compatible with common assistive hardware and software devices.

Both accessible and universal designs are concerned with addressing the needs of users beyond those considered to be average or typical.



Examples of Universal Designs (picture courtesy of FPIntell)

1.3. Usable Design

Usability has been defined by the International Organization for Standardization as the "effectiveness, efficiency, and satisfaction with which a specified set of users can achieve a specified set of tasks in a particular environment." Like accessible and universal design, usable design serves to create products that are easy and efficient to use. Usability engineers test the ease at which users can learn to operate a product and remember how to do so when they return to the product at a later time.

But unfortunately, people with disabilities are not always included in usability tests. As a result, many products that perform well in usability tests are not really accessible to people with disabilities. On a good note, accessible and universal design considerations are increasingly being addressed by usability professionals.

Usability shares some key goals with accessibility and universal design. Designers in all three disciplines seek to create product features that are easily discovered and operated by the user. Usability engineers are concerned with aspects of the user experience which include:

- Learnability: Whether users can easily learn how to operate the product, remember how to use it later on.
- Consistency: Whether the product features clearly and consistently labeled.
- Efficiency and effectiveness: Whether the users can perform tasks with a minimal amount of effort and achieve their goals successfully.

2. Accessible Society

The Committee on the Rights of Persons with Disabilities, one of the committees in the UN human rights treaty bodies system, adopted its General Comment No 2 on the issue of Accessibility.

The General Comment to The Convention on the Rights of Persons with Disabilities (CRPD) aims to provide guidance to all relevant stakeholders, such as states and international organizations, on how to ensure accessibility for persons with disabilities. Without access to the physical environment, transportation, information and communication, including information and communications technologies (ICTs) and systems, and to other facilities and services open or provided to the public, persons with disabilities would not have equal opportunities for participation in their respective societies.

A society built without considering the disabled is a handicapped society. To ensure equal opportunities, development and legislation made should be inclusive and accessible. For example, a person having lower body impairment shouldn't be climbing the stairs to access services and facilities.

Some factors to consider in creating an inclusive and accessible society are:

- Changing our daily attitudes towards disabled persons concerning education, employment and etc. A disabled person should be employed not because he/she is disabled, but because he/she deserves the job. And for this, inclusive environments for enabling education within the society are important together with ensuring that proper equipment/tools for the work are made available.

- Creating accessible environments: Facilitate movement and independency of disabled persons. Supports to enable people with disabilities to flourish must be created. For example, allow for public transport and schools with accessibility facilities. This is where Accessible Design and Universal Design should be considered.
- Introduce and amend laws to create enabling legislations: Laws are meant to protect. Greater protection must be given to those less able to defend themselves. Special units can be established to deal exclusively with matters relative to disabled persons.
- Revamp existing institutions for disabled: Some institution already in place have not been performing as it should. These institutions are meant to protect the rights of people with disabilities but have failed them in many areas. It is a start but at best, it is still not good enough. These institutions need to be revamped and revitalized and provide them with controlled autonomy with time-based performance appraisals.

The disability issue is cumbersome in itself. Yet, it is a heavier burden if left uncared and untouched. Authorities are saying that they envision supporting disabled persons without really acting to show the real support. The barriers that people with disabilities face are those of isolation, exclusion and low expectations.

2.1. Assistive Technology for Accessible Society

Assistive technology is a term that includes assistive, adaptive, and rehabilitative devices for people with disabilities and also includes the process used in selecting, locating, and using them. Assistive technology promotes greater independence by enabling people to perform tasks that they were formerly unable to accomplish, or had great difficulty accomplishing, by providing enhancements to, or changing methods of interacting with, the technology needed to accomplish such tasks.

The term adaptive technology is often used as the synonym for assistive technology. However, they are different. Assistive technology refers to any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. Adaptive technology however covers items that are specifically designed for persons with disabilities and would seldom be used by non-disabled persons. In other words, assistive technology is any object or system that increases or maintains the capabilities of people with disabilities, while adaptive technology is any object or system that is specifically designed for the purpose of increasing or maintaining the capabilities of people with disabilities. Consequently, adaptive technology is a subset of assistive technology. Adaptive technology often refers specifically to electronic and information technology access.

2.2. Information and Communication Technology (ICTs)

The Convention on the Rights of Persons with Disabilities (CRPD) is the first human rights treaty of the 21st century to explicitly address the importance of ensuring access to ICTs (Article 9 of the CRPD). The importance of ICTs lies in its ability to introduce a wide range of new services, transform existing services and create greater demand for access to information and knowledge – particularly for underserved and excluded populations, such as persons with disabilities. Article 12 of the International Telecommunication Regulations, expresses the right for persons with disabilities to access international telecommunication

services. Taking into account other relevant International Telecommunication Union (ITU) recommendations, this Article could serve as a basis to reinforce State Parties' national legislative frameworks.

The strict application of universal design should ensure full, equal and unrestricted access for all potential consumers, including persons with disabilities, in a way that takes full account of their inherent dignity and diversity. Accessibility of information and communication, including ICTs, should be achieved from the beginning since subsequent adaptations to the technologies may be expensive, thus making these services less affordable and less accessible for persons with disabilities. It is therefore more economical to incorporate mandatory ICTs accessibility features from the earliest stages of design and production.

Since a lack of accessibility is often the result of insufficient awareness and technical know-how, training and educational program to all stakeholders on accessibility for persons with disabilities have to be in place. Training should be provided not just to those designing goods and services, but also to those who actually produce them. In addition, strengthening the direct involvement of persons with disabilities in product development would very much improve the understanding of the existing needs and the effectiveness of accessibility tests.

New technologies can be used to promote the full and equal participation of persons with disabilities in society, only and only if they are designed and produced in a way that ensures their accessibility. New investments and research production should contribute to eliminating inequality, not to the creation of new barriers. The design, development, production and distribution of accessible ICTs should start at an early stage. This is so that these technologies and systems can become accessible at minimum cost.

Often, disability laws fail to include ICTs in their definition of accessibility, while disability rights laws concerned with non-discriminatory access – in areas such as procurement, employment and education – fail to include access to ICTs and the many goods and services offered through ICTs that are central to modern societies. Legislation should provide for the mandatory application of accessibility standards as well as sanctions, including fines, for those who fail to apply them.

2.3. The World Wide Web (www)

Properly designed websites and web tools should be able to be used by people with disabilities. However, currently many sites and tools are developed with accessibility barriers that make it difficult or impossible for some people to use them.

The Web is fundamentally designed to work for all people, whatever their hardware, software, language, culture, location, or physical or mental ability. When the Web meets this goal, it is accessible to people with a diverse range of hearing, movement, sight, and cognitive ability.

Thus the impact of disability is radically changed on the Web because the Web removes barriers to communication and interaction that many people face in the physical world. However, when websites, web technologies, or web tools are badly designed, they can create barriers that exclude people from using the Web.

The mission of the Web Accessibility Initiative (WAI) of the World wide Web Consortium (W3C) is to lead the Web to its full potential to be accessible, enabling people with disabilities to participate equally on the Web.

It is essential that the Web be accessible in order to provide equal access and equal opportunity to people with diverse abilities. the UN Convention on the Rights of Persons with Disabilities recognizes access to information and communications technologies, including the Web, as a basic human right.

Accessibility supports social inclusion for people with disabilities as well as others, such as older people, people in rural areas, and people in developing countries.

There is also a strong business case for accessibility. Accessibility overlaps with other best practices such as mobile web design, device independence, multi-modal interaction, usability, design for older users, and search engine optimization (SEO). Case studies show that accessible websites have better search results, reduced maintenance costs, and increased audience reach, among other benefits.

The World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) brings together people from industry, disability organizations, government, and research labs from around the world to develop guidelines and resources to help make the Web accessible to people with disabilities including auditory, cognitive, neurological, physical, speech, and visual disabilities.

2.4. Computer Accessibility

In human–computer interaction, computer accessibility (also known as accessible computing) refers to the accessibility of a computer system to all people, regardless of disability or severity of impairment, examples include web accessibility guidelines. Another approach is for the user to present a token to the computer terminal, such as a smart card, that has configuration information to adjust the computer speed, text size, etc. to their particular needs. This is useful where users want to access public computer based terminals in Libraries, ATM, Information kiosks and etc. This development has been supported in Europe but with limited success due to the lack of interest from public computer terminal suppliers.

Assistive technology may attempt to improve the ergonomics of the devices themselves such as Dvorak and other alternative keyboard layouts, which offer more ergonomic layouts of the keys. Assistive technology devices have been created to enable people with disabilities to use modern touch screen mobile computers such as the iPad, iPhone and iPod touch. The Pererro is a plug and play adapter for iOS devices which uses the built in Apple Voice Over feature in combination with a basic switch. This brings touch screen technology to those who were previously unable to use it. Apple, with the release of iOS 7 had introduced the ability to navigate apps using switch control. Switch access could be activated either through an external Bluetooth connected switch, single touch of the screen, or use of right and left head turns using the device's camera. Additional accessibility features include the use of Assistive Touch which allows a user to access multi-touch gestures through pre-programmed onscreen buttons.

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The modern Dvorak Simplified Keyboard - US layout (Image Courtesy of Google)

For users with physical disabilities a large variety of switches are available and customizable to the user's needs varying in size, shape, or amount of pressure required for activation. Switch access may be placed near any area of the body which has consistent and reliable mobility and less subject to fatigue. Common sites include the hands, head, and feet. Eye gaze and head mouse systems can also be used as an alternative mouse navigation. A user may utilize single or multiple switch sites and the process often involves a scanning through items on a screen and activating the switch once the desired object is highlighted.

2.5. Assistive Technology in Sports

Assistive technology in sport is an area of technology design that is relatively new and growing at a rapid speed. Assistive technology is the array of new devices created to enable sports enthusiasts who have disabilities to play. Assistive technology may be used in [adaptive sports](#), where an existing sport is modified to enable players with a disability to participate. Assistive technology may also be used to invent a completely new sports with athletes with disabilities exclusively in mind.



Bike for cycling sport for individual with lower mobility impairments (Image courtesy of Google)

Thanks to technology and new legislations, an increasing number of people with disabilities are participating in sports, leading to the development of new assistive technology. Assistive technology devices can be simple or low-tech or they may use highly advanced technology, with some even using computers. Accordingly, assistive technology can be found in sports ranging from local community recreation to the elite [Paralympic Games](#). More complex assistive technology devices have been developed over time, and as a result, sports for people

with disabilities have changed from being a clinical therapeutic tool to an increasingly competition-oriented activity.

Conclusion - Effects of Technology towards Accessible Society

Overall, accessible society in terms of technology aims to allow people with disabilities to participate more fully in all aspects of life and increases their opportunities for education, social interactions, and potential for meaningful employment. It creates greater independence and control for disabled individuals.

In theory, if product designers apply universal design principles, with a special focus on accessibility for people with disabilities, and if usability experts routinely include people with a variety of disabilities in usability tests, more products will be accessible to and usable by everyone.

But that is not the case yet. A lot of efforts have been done to achieve this goal, but we still have a long way to go. It requires people with the motivation to promote change for a better accessible world. Then again, it also involves costs and changing mindset of policy makers. All this is not impossible. We have made quite substantial differences although much work is still needed. Overtime, we will achieve the goals and the next generation will at least have a better future ahead of them.

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