



# IAAP

International Association  
of Accessibility Professionals



**CERTIFIED PROFESSIONAL  
IN ACCESSIBILITY  
CORE COMPETENCIES**

**Body of Knowledge**

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**United in Accessibility**

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# 1. The Purpose of this Document

This Body of Knowledge document outlines the knowledge and skills expected of candidates seeking to obtain the Certified Professional in Accessibility Core Competencies (CPACC) credential. Specifically, the three main purposes of this document are to:

- List the categories of information covered in the exam
- Present general information about each category
- Recommend study tasks
- Provide links to resources on each topic

The Body of Knowledge is an open resource that is designed to be a starting point when studying for the CPACC exam. It presents concepts, theories and other information that should be mastered to indicate possession of core competencies expected of accessibility professionals. The Body of Knowledge is also designed to help candidates prepare for the exam and provides references to resources for additional learning and exploration. However, it does not provide an exhaustive explanation of every concept or question on the exam; its use does not guarantee candidate success.

The web is a dynamic place, and so we cannot guarantee that all links will continue to work. If you discover any broken links, please alert us by sending an email to [certification@accessibilityassociation.org](mailto:certification@accessibilityassociation.org)

## 2. IAAP Exam Preparation Resources

Prospective test-takers are welcome to prepare for the exam by studying high quality materials available from reputable sources. IAAP lists a collection of both free and for-purchase CPACC preparation resources on the [Prepare for the exam](#) page. Please be aware that a preparation course alone cannot guarantee success on the exam. Along with the Body of Knowledge, candidates should review the [CPACC Certification Content Outline](#) to determine where they should spend their time studying information that is new or not fully familiar to them.

The IAAP also maintains a list of approved exam preparation providers on the IAAP [Approved Certification Preparation Providers](#) page.



## 3. About the CPACC Credential

The Certified Professional in Accessibility Core Competencies credential is IAAP's foundational certification, representing the practical application of broad, cross-disciplinary conceptual knowledge about 1) disabilities, 2) accessibility and universal design, and 3) accessibility-related standards, laws, and management strategies.

Relevant domains for the CPACC credential include:

- The web and other information communication technologies (ICT)
- Architecture and the built environment
- Consumers and industrial design
- Transportation systems, and
- Any domain in which thoughtful design, policy, and management can improve disability access.

The CPACC can be considered the baseline IAAP credential for both non-technical and technical accessibility roles. For those who do work at the technical level, IAAP also offers the Web Accessibility Specialist (WAS) credential. Individuals who pass the CPACC and WAS exams carry a higher-level credential called the Certified Professional in Web Accessibility (CPWA). The IAAP has plans to grow domain specific designation offerings and will announce when those additional certification exams are available to the public.

### 3.1. The CPACC Exam Content at a Glance

#### 3.1.1. Disabilities, Challenges and Assistive Technologies (40% of the exam)

- Theoretical Models of Disability
- Categories of Disabilities and Associated Barriers (ICT and Physical World)
- Assistive Technologies and Adaptive Strategies
- Disability Demographics and Statistics
- Disability Etiquette

### **3.1.2. Accessibility and Universal Design (40% of the exam)**

- Individual Accommodations versus Inclusive Design
- Benefits of Accessibility
- Accessibility in Information Communication Technology (WCAG 2.1)
- Accessibility in the Physical World (The Principles of Universal Design 2.0)
- Universal Design for Learning Guidelines (UDL)
- Accessibility, Usability, and User Experience (UX)

### **3.1.3. Standards, Laws, and Management Strategies (20% of the exam)**

- International Conventions and Treaties on Disability Rights
- Categories of Disability Laws and Regulations
- Applying Accessibility Standards and Regulations to ICT
- Organizational Governance and Management

## **3.2. Additional Information**

- [IAAP main web site](#)
- [General Information about IAAP Certification](#)
- [CPACC Certification Content Outline](#)
- [CPACC Frequently Asked Questions](#)
- [CPACC Preparation Resources](#)
- [IAAP-Approved Certification Preparation Providers](#)
- [Continuing Accessibility Education Credit FAQ](#)
- [Process of creating a professional certification](#)

## 4. Disabilities, Challenges, and Assistive Technologies

### 4.1. Theoretical Models of Disability

#### Recommended Study Tasks

- Identify prominent theoretical models of disability.
- Describe their basic concepts, and understand their strengths and weaknesses.
- Identify which models align most closely with the principles of accessibility and universal design.
- Apply the models to example scenarios in the lives of people with disabilities.

#### Overview

Theoretical models of disability provide perspectives and frameworks through which to understand disability. No model is comprehensive, so can be neither fully correct nor incorrect. Each has strengths as well as limitations. In practice, organizations generally make use of aspects of multiple models, in particular the social and medical models.

#### Resources

- World Health Organization: [Towards a Common Language for Functioning, Disability and Health](#): ICF: The International Classification of Functioning, Disability and Health
- NCBI, US National Library of Medicine, National Institutes of Health, Current Reviews in Musculoskeletal Medicine: [Rethinking Disability: the Social Model of Disability and Chronic Disease](#)
- UK Ombudsman: [Introduction to the Social and Medical Models of Disability](#)
- University of Leicester: [The Social and Medical Model of Disability](#)
- Association of University Centers on Disabilities, Disability in Public Health: [Compare and Contrast Different Models of Disability](#)
- National Center for Biotechnology Information, US National Library of Medicine: [US Surgeon General's Call to Action to Improve the Health and Wellness of Persons with Disabilities](#)

- American Psychological Association, Psychological Bulletin: The Social Identity Approach to Disability: [Bridging Disability Studies and Psychological Science](#)
- Dirth, Thomas P., and Branscombe, Nyla R. International Studies in Sociology of Education: [Disability as a Cultural Identity](#)
- Lane, Harlan. Journal of Deaf Studies and Deaf Education: [Ethnicity, Ethics, and the Deaf-World](#)

## Additional Reading

- Art Beyond Sight: [Social and Medical Models of Disability: Paradigm Change](#)
- Disabled World: [Disabilities: Definition, Types and Models of Disability](#)
- Travability Blog: [The Economic Model of Inclusive Travel](#)

### 4.1.1. Medical Model

#### Definitions

**From Disabled World:** “The medical model is presented as viewing disability as a problem of the person, directly caused by disease, trauma, or other health condition which therefore requires sustained medical care provided in the form of individual treatment by professionals. In the medical model, management of the disability is aimed at a ‘cure,’ or the individual’s adjustment and behavioral change that would lead to an ‘almost-cure’ or effective cure. In the medical model, medical care is viewed as the main issue, and at the political level, the principal response is that of modifying or reforming health care policy.”

**From the US National Institutes of Health:** “One result of the common medical understanding of disability is that people with disabilities often report feeling excluded, undervalued, pressured to fit a questionable norm, and / or treated as if they were globally incapacitated. People with disabilities often express frustration when they are met with pitying attitudes or incredulity if they speak about anything positive related to living with their conditions.”

**From the University of Leicester, UK:** “The medical model of disability views disability as a ‘problem’ that belongs to the disabled individual. It is not seen as an issue to concern anyone other than the individual affected. For example, if a wheelchair-using student is unable to get into a building because of some steps, the medical model would

suggest that this is because of the wheelchair, rather than the steps.

### Strengths

The medical model can address the biological sources of disabilities, either by clinically curing them or providing ways to medically manage the conditions. The medical component of disabilities is a critical reality for many people.

### Weaknesses

The medical model treats disability as a problem or inherent characteristic of the individual and seeks a cure or medical management of a bodily condition, often overlooking the broader sociopolitical constraints imposed by unwelcoming or inaccessible environments.

## 4.1.2. Social Model

### Definitions

**From Disabled World:** “The social model of disability sees the issue of ‘disability’ as a socially created problem and a matter of the full integration of individuals into society. In this model, disability is not an attribute of an individual, but rather a complex collection of conditions, many of which are created by the social environment. Hence, the management of the problem requires social action and is the collective responsibility of society at large to make the environmental modifications necessary for the full participation of people with disabilities in all areas of social life. The issue is both cultural and ideological, requiring individual, community, and large-scale social change. From this perspective, equal access for someone with an impairment / disability is a human rights issue of major concern.”

**From the University of Leicester, UK:** “This model draws on the idea that it is society that disables people, through designing everything to meet the needs of the majority of people who are not disabled. There is a recognition within the social model that there is a great deal that society can do to reduce, and ultimately remove, some of these disabling barriers, and that this task is the responsibility of society, rather than the disabled person. The social model is more inclusive in approach, as pro-active thought is given to how disabled people can participate in activities on an equal footing with non-disabled people. Certain adjustments are made, even where this involves time or money, to ensure that disabled people are not excluded. The onus is on the organiser of the event or activity to make sure that their activity is accessible. Examples might be:

- A course leader who meets with a visually impaired member of the group before the beginning of a course to find out how hand-outs can be adapted so that the student can read them;
- A member of staff who makes PowerPoint presentations available on Blackboard to all members of the group before a lecture. This allows dyslexic students to look up unfamiliar terminology before the lecture and gives them an idea of the structure that will be followed. This 'framing' helps students to understand and retain the information;
- A Students' Union society that consults with disabled members before organising an event in order to make sure that the venue is accessible."

For disability advocates the social model of disability has become a rallying cry for social justice.

### Strengths

The social model's focus on the disabling conditions in the environment and in society makes it clear that the barriers and challenges experienced by people with disabilities are not inevitable, nor are they exclusively a characteristic of the individual's "broken" body. Societies can improve the lives of people with disabilities considerably by ensuring that the world is designed to accommodate a wide range of human characteristics and abilities.

### Weaknesses

The social model of disability can tend to downplay the embodied aspects of disabilities too much, as if disability had nothing to do with bodily characteristics at all. The social model's push for social justice in the political arena can also put activists at odds with people with other political interests, antagonizing relationships and sometimes creating resolute political adversaries.

## **4.1.3. Biopsychosocial Model**

### Definition

In 2002, the World Health Organization published the International Classification of Functioning, Disability and Health, which describes the complex phenomenon of disability and integrates the social and medical models:

"A better model of disability, in short, is one that synthesizes what is true in the medical and social models, without making the mistake each makes in reducing the whole, complex notion of disability to one of its aspects. This more useful model of

disability might be called the biopsychosocial model. ICF is based on this model, an integration of medical and social. ICF provides, by this synthesis, a coherent view of different perspectives of health: biological, individual and social.”

#### 4.1.4. Economic Model

##### Definition

From Disabled World: “The economic model of disability defines disability by a person’s inability to participate in work. It also assesses the degree to which impairment affects an individual’s productivity and the economic consequences for the individual, employer and the state. Such consequences include loss of earnings for and payment for assistance by the individual; lower profit margins for the employer; and state welfare payments. This model is directly related to the charity model.”

##### Strengths

The economic model recognizes the effect of bodily limitations on a person’s ability to work, and there may be a need for economic support and / or accommodations for the person’s disability.

##### Weaknesses

The economic model creates a legally defined category of people who are needy, which can be stigmatizing for people with disabilities. Also, if a person doesn’t meet the legal threshold for disabled, or if there is a dispute as to a person’s disability, the person with the disability may not receive the support they need.

#### 4.1.5. Functional Solutions Model

##### Definition

The functional solutions model of disability is a practical perspective that identifies the limitations (or “functional impairments”) due to disability, with the intent to create and promote solutions to overcome those limitations. The primary task is to eliminate, or at least reduce, the impact of the functional limitations of the body through technological or methodological innovation. The pragmatism of the functional solution model deemphasizes the sociopolitical aspects of disability, and instead prioritizes inventiveness and entrepreneurship.

### **Strengths**

The strongest aspect of this model is that it is results-oriented. It seeks to provide solutions to real-world challenges, while sidestepping the often-convoluted sociopolitical implications of disability within society.

### **Weaknesses**

When new technologies are involved, profit-driven entrepreneurs can sometimes miss the mark, creating products that may be innovative but not practical or useful, or which may be of more benefit to the innovators than to the target population, especially if the proposed solutions are expensive. Also, when the primary cause of a particular challenge is the socioeconomic circumstances in the environment, the functional solutions model's de-emphasis on socioeconomic issues can cause would-be innovators to ignore the most important aspects of the original problem.

## **4.1.6. Social Identity or Cultural Affiliation Model**

### **Definition**

The social identity or cultural affiliation model refers to a sense of deriving one's personal identity from membership within a group of like-minded individuals. This model is most evident among people who are deaf, because of their shared linguistic experience as sign language users. For example, Deaf culture and identity owes much of its strength to the somewhat exclusive nature of being a part of a close-knit linguistic minority.

Other people with disabilities may also feel a sense of belonging to a community with common life experiences and interests.

### **Strengths**

The social identity or cultural affiliation model accepts the person's disability completely and uses it as a point of pride in being associated with other people in a similar condition.

### **Weaknesses**

The sense of belonging felt by one group of people can be counterbalanced by a feeling of exclusion by people who don't fit the group's expectations.



### 4.1.7. Charity Model

#### Definition

The charity model regards people with disabilities as unfortunate and in need of assistance from the outside, with those providing charity viewed as benevolent contributors to a needy population.

#### Strengths

The charity model can inspire people to contribute their time and / or resources to provide assistance when it is genuinely needed.

#### Weaknesses

The charity model can be condescending toward people with disabilities, who may come to resent the feeling that they are the object of pity by other people, and that they must depend on accepting or cultivating this pity on a continual basis. The charity model often focuses on short-term, immediate needs, often at the expense of more comprehensive, and ultimately more effective, long-term solutions.

## 4.2. Categories and Characteristics of Disabilities and Associated Barriers

### Recommended Study Tasks

- Name the main categories of disabilities.
- Classify specific conditions under the appropriate disability category or categories.
- Describe the accessibility challenges faced by people with disabilities of a given category.

### Overview

There are many types of disabilities that affect people's abilities to see, hear, speak, move, think and feel. This section provides information on the main categories and types of disabilities along with the barriers people with disabilities often face to full participation in society.

## Resources

In addition to the general resources listed here, each topic in this section ends with resources specific to it.

- World Wide Web Consortium, Web Accessibility Initiative: [Diverse Abilities and Barriers](#)
- US Centers for Disease Control and Prevention: Disability and Health Overview [Impairments, Activity Limitations, and Participation Restrictions](#)
- United Nations, Department of Economic and Social Affairs, Social Inclusion: [Chapter V: Persons with Disabilities: Breaking Down Barriers](#)
- Council of Ontario Universities, University of Ottawa: [Understanding Barriers to Accessibility](#)
- Project IDEAL: [Disability Categories](#)

## Additional Reading

- American Speech-Language-Hearing Association: [Effects of Hearing Loss on Development](#)
- Livestrong.com: [Challenges That Blind People Face](#)
- Disabled World: [Neurological Disorders: Types, Research and Treatment News](#)
- Disabled World: [Physical and Mobility Impairment Information](#)
- UK Ofcom Report by Growth from Knowledge: [Experience of People with Upper-Body Mobility and Dexterity Impairments in the Communications Market](#)

## 4.2.1. Visual Disabilities

### Overview

Visual disabilities are sensory disabilities that can range from some amount of vision loss, loss of visual acuity, or increased or decreased sensitivity to specific or bright colors, to complete or uncorrectable loss of vision in either or both eyes.

### Blindness

**Definition:** Blindness is a sensory disability involving nearly complete vision loss.

**Characteristics:** Some people are completely blind, without the ability to see anything. Others can perceive light versus dark, or the general shapes of large objects, but cannot read text or recognize people by sight.

**Demographics:** As reported by the World Health Organization Fact Sheet: Vision Impairment and Blindness:

- Globally, at least 2.2 billion people have a vision impairment or blindness, of whom at least 1 billion have a vision impairment that could have been prevented or has yet to be addressed.
- The 1 billion people with vision impairment includes those with moderate or severe distance vision impairment or blindness due to unaddressed refractive error, as well as near vision impairment caused by unaddressed presbyopia.
- Globally, the leading causes of vision impairment are uncorrected refractive errors and cataracts.
- The majority of people with vision impairment are over 50 years of age.

### Color Blindness

**Definition:** Color blindness is a sensory disability that impairs a person's ability to distinguish certain color combinations.

**Characteristics:** The most common forms of color-blindness affect an individual's ability to distinguish reds and greens, although other colors may be affected.

**Demographics:** According to the US National Institutes of Health, US National Library of Medicine, Genetics Home Reference article, Color Vision Deficiency:

- Red-green color vision defects are the most common form of color vision deficiency. This condition affects males much more often than females. Among populations with Northern European ancestry, it occurs in about 1 in 12 males and 1 in 200 females. Red-green color vision defects have a lower incidence in almost all other populations studied.
- Blue-yellow color vision defects affect males and females equally. This condition occurs in fewer than 1 in 10,000 people worldwide.

Blue cone monochromacy is rarer than the other forms of color vision deficiency, affecting about 1 in 100,000 people worldwide. Like red-green color vision defects, blue cone monochromacy affects males much more often than females.

## Low Vision

**Definition:** The American Federation for the Blind offers a functional definition:

- Low vision is uncorrectable vision loss that interferes with daily activities. It is better defined in terms of function, rather than numerical test results.
- In other words, low vision is “not enough vision to do whatever it is you need to do,” which can vary from person to person.
- Most eye care professionals prefer to use the term “low vision” to describe permanently reduced vision that cannot be corrected with regular glasses, contact lenses, medicine, or surgery.

**Characteristics:** A person with low vision will typically need magnification to see well enough to read or discern other details. Some people with low vision experience low contrast, and therefore benefit from high contrast text and graphics. Some experience color deficiencies, which means they may not be able to see the difference between certain colors.

**Demographics:** According to the World Health Organization, about 246 million people, or 3.5% of the world’s population, have low vision. About 90% of people with vision impairments live in low income settings.

## Barriers for People with Visual Disabilities

From the W3C's Web Accessibility Initiative and other sources:

- Materials, such as books, restaurant menus and navigation aids, that are not made available in alternate formats such as digital files or braille.
- Speakers who do not provide descriptions that would help with navigation or understanding information otherwise conveyed visually.
- In websites and other technologies, images, controls, and other structural elements that do not provide text alternatives.
- Text, images, and page layouts that cannot be resized, or that lose information when resized.
- Missing visual and non-visual orientation cues, page structure, and other navigational aids.
- Video content that does not have text or audio alternatives, or an audio-description track.
- Inconsistent, unpredictable, and overly complicated navigation mechanisms and page functions.
- Text and images with insufficient contrast between foreground and background color combinations.
- Websites, web browsers, and authoring tools that do not support the use of custom color combinations.
- Websites, web browsers, and authoring tools that do not provide full keyboard support.

## Resources on Visual Disabilities

- World Health Organization, Fact Sheet: [Blindness and Vision Impairment](#)
- American Federation for the Blind: [Low Vision and Legal Blindness Terms and Descriptions](#)
- US National Institutes of Health, US National Library of Medicine, Genetics Home Reference: Color Vision Deficiency
- US National Institutes of Health, National Eye Institute: [Color Blindness](#)

## 4.2.2. Auditory Disabilities

### Overview

Auditory disabilities are sensory disabilities that range from partial to complete hearing loss.

### Deafness

**Definition:** Deafness is the total or near total loss of hearing.

**Characteristics:** A person who is deaf or hard of hearing has difficulty with sounds, including the audio component of multimedia materials. Many, but not all, people who are deaf know sign language. Often sign language is the first language — and therefore the most comfortable native language — of those who are born deaf. They may feel less comfortable reading printed or digital text because it is a foreign language for them, and the phonetic notation does not help their comprehension. By way of contrast, those who lose their hearing later in life may never learn sign language, or if they learn it, they may not feel as comfortable speaking in sign, and may prefer text.

### Hard of Hearing

**Definition:** Hard of hearing (HOH) refers to people with hearing loss ranging from mild to severe, who still have some useful hearing, and may communicate through sign language, spoken language, or both understand spoken language in some situations, with or without amplification. Most HOH people can use the phone and use hearing aids.

**Characteristics:** Individuals who are hard of hearing have partially-impaired hearing in one or both ears, resulting in a mild-to-moderate hearing loss where there may be enough residual hearing that an auditory device, such as a hearing aid or FM system, provides adequate assistance to process speech. A person who hard of hearing has difficulty with sounds, including the audio component of multimedia materials.

**Demographics:** According to the World Health Organization, an estimated 466 million people, or 6.1 percent of the world's population, are deaf or hard of hearing.

## Central Auditory Processing Disorder

**Definition:** According to the American Speech-Language-Hearing Association:

- Auditory processing disorder (APD) is often described as greater than expected difficulty hearing and understanding speech even though no measurable hearing loss exists. Individuals with auditory processing disorders may act as though a hearing loss is present when in fact, hearing sensitivity is often within normal limits. APD is often confused with other disorders such as ADHD, language impairment, learning disabilities, social and emotional delays or cognitive deficits.
- APD is not the inability to hear. It's the inability to interpret, organize, or analyze what's heard. All the parts of the hearing pathway are working well. But parts of the brain are not.

**Characteristics:** People with Central Auditory Processing Disorder can have difficulty with, among other things, locating the source of a sound, understanding what someone is saying if the environment is loud or there are competing sounds, following spoken directions, learning songs or instruments, paying attention, responding in a timely way, or learning a new language. Behaviors can vary depending on the individual and the presence of other disorders.

**Demographics:** It is estimated that approximately 5% of the global population have Central Auditory Processing Disorder.

## Barriers for People with Auditory Disabilities

From the W3C's Web Accessibility Initiative and other sources:

- People speaking softly, or in large spaces without amplification such as through microphones.
- Unavailability of sign language interpretation.
- Environments that are loud or present competing sounds.
- Websites and other technologies that require voice for interaction or listening for understanding.
- Audio in videos and films that are presented without captions or transcripts.
- Media players that do not support caption, or options to control the volume, or the size and colors of captions.

## Resources on Auditory Disabilities

- World Health Organization: Health Topics: [Deafness and Hearing Loss](#)
- American Speech-Language-Hearing Association: [What is Hearing Loss?](#)
- American Speech-Language-Hearing Association: [Auditory Processing Disorder](#)

## 4.2.3. Deaf-blindness

### Overview

Deaf-blindness is a rare condition, that requires touch as the primary means of communication.

**Definition:** Deaf-Blindness is a sensory disability that includes both deafness and blindness. Most people who are deafblind are not completely deaf nor completely blind, and retain some hearing and sight capability.

**Characteristics:** A person who is both deaf and blind experiences all the characteristics of those two disabilities, with the added complexity that the absence of both vision and hearing severely limits the sensory input possibilities of the individual to just touch, smell, and taste. Of those senses, touch is the only viable method for complex communication. A deafblind person would need to learn braille to access text, and sign language to access conversations (the deafblind person would feel the hands of the other person signing in the conversation).

**Demographics:** The incidence of deaf-blindness is low. According to the World Federation of the Deafblind, between 0.2% and 2% of the world's population is deaf-blind.

### Barriers for People with Deaf-Blindness

- For materials such as books, menus and navigation aids, lack of printed braille.
- In websites and other technologies, lack of output to a braille keyboard.
- Lack of transcripts of video or audio materials made available in braille.
- Lack of tactile sign language interpretation.



## Resources on Deaf-blindness

- National Center on Deaf-Blindness: [Overview on Deaf-Blindness](#)
- Deafblind International: [What is Deaf-Blindness?](#)
- Perkins School for the Blind, Webcast: [Communication Technology for Persons Who Are Deafblind](#)

## 4.2.4. Speech Disabilities

### Overview

Speech disorders can range from mild slurred speech to the complete inability to move the mouth to speak. The ability to physically speak may be completely unrelated to the person's language capabilities; they may be able to read, write, and understand language, even if their mouth structure or neuromuscular connections do not allow them to articulate. Speech disorders may be caused by or a side-effect of underlying disabilities. A person's speech may improve, remain stable, or progressively worsen over time.

### Articulation

**Definition:** According to Texas Children's Hospital, articulation disorder is a speech disorder involving difficulties in producing specific types of sounds. Articulation disorders often involve substitution of one sound for another, slurring of speech, or indistinct speech. There are three categories of articulation disorders:

- **A speech sound disorder:** When mistakes continue past a certain age.
- **A phonological process disorder:** When there are patterns of not saying words correctly.
- **A motor speech disorder:** When a person has trouble moving muscles required to talk.

**Characteristics:** According to Stanford Children's Health, characteristics can include:

- Leaving off sounds from words
- Adding sounds to words
- Distorting sounds in words
- Swapping sounds in words

**Demographics:** Statistics from the National Institute on Deafness and Other Communication Disorders indicate that the prevalence of speech sound disorders in young children is 8 to 9%. By the first grade, roughly 5 percent of children have noticeable speech disorders, most of which have no known cause.

## Aphasia

**Definition:** According to the National Aphasia Association definition, “Aphasia is an impairment of language, affecting the production or comprehension of speech and the ability to read or write. Aphasia is always due to injury to the brain—most commonly from a stroke, particularly in older individuals. But brain injuries resulting in aphasia may also arise from head trauma, from brain tumors, or from infections.”

**Characteristics:** There are various types of aphasia. A person with aphasia may not be able to recognize words or understand what is being said, be unable to speak or have difficulty saying what they mean, difficulty forming sentences and omitting words.

**Demographics:** Statistics from the National Aphasia Association state that:

- There are at least 2,000,000 people in the USA with aphasia
- There are at least 250,000 people in Great Britain with aphasia

The global incidence rate is currently unknown.

## No Speech

**Definition:** Having no speech, or mutism, is an inability to speak and can be caused by damage to the brain and / or speech muscles, by emotional or psychological reasons, or by a combination of causes.

**Characteristics:** Neurogenic mutism is often a manifestation of extreme forms of other speech disorders, including aphasia, apraxia or dysarthria. There are three types of psychogenic mutism: selective mutism, in which a person chooses not to speak, selective mutism, in which a person wants to speak but due to anxiety cannot in certain situations, and total mutism, in which a person does not speak under any circumstance.

**Demographics:** Selective mutism is estimated to affect 0.47 to 0.76 percent of the population. Statistics on the incidence of neurogenic mutism are unavailable.

## Barriers for People with Speech Disabilities

- Lack of text-based alternatives for speech communication.

## Resources on Speech Disabilities

- Stanford Children's Health: [Speech Sound Disorders in Children](#)
- Texas Children's Hospital, Health Conditions: [Articulation Disorders](#)
- US National Institutes of Health, National Institute on Deafness and Other Communication Disorders: [Statistics on Voice, Speech, and Language](#)
- National Aphasia Association: [Aphasia Definitions](#)

## 4.2.5. Mobility, Flexibility, and Body Structure Disabilities

### Overview

Mobility impairment includes people with upper or lower limb loss or disability, challenges with manual dexterity, disability in co-ordination with different organs of the body, or with a broken skeletal structure. Physical and mobility impairments cause limitations in independent, purposeful physical movement of the body or of one or more extremities. The alteration in the person's mobility may be temporary or permanent. Disability in mobility can be congenital, acquired with age, or be the consequence of disease.

### Manual Dexterity/Fine Motor Control

**Definition:** Fine motor skills are the intricate and detailed movements of the hand and wrist needed to manipulate, control and use objects, produce neat, legible handwriting, and dress independently. Fine motor skills involve the coordinated efforts of the brain and muscles, and are built on the gross motor skills that allow us to make bigger movements. Disability may be temporary, recurring, or permanent.

**Characteristics:** Some examples include difficulty tying shoelaces, inability to do up buttons or zippers, scribbly drawing, difficulty using a keyboard, poor handwriting, taking a long time to pick up small objects, manipulating objects in hand, or using both hands at the same time.

**Demographics:** Direct statistics are unavailable. However, according to the US National Institutes of Health, difficulties in fine motor skills are prevalent among children with Attention Deficit Disorder, which affects between 3 and 7 percent of children worldwide.

### Ambulation

**Definition:** The Nursing Outcomes Classification defines ambulation as the ability to walk from place to place independently with or without an assistive device.

**Characteristics:** Impairments to a person's ability to walk may be caused by congenital conditions, disease, or injury, such as cerebral palsy, neuromuscular disorders, amputation, arthritis, and back injuries.

**Demographics:** There are no specific statistics on ambulation disabilities. According to the US Centers for Disease Control, 3.5 percent of adults in the US have mobility disabilities.

### Muscle Fatigue

**Definition:** According to the US National Institutes of Health:

Muscle fatigue is a common non-specific symptom experienced by many people and is associated with many health conditions. It is often defined as an overwhelming sense of tiredness, lack of energy and feeling of exhaustion, and it relates to a difficulty in performing voluntary tasks.

**Characteristics:** According to Healthline.com:

Muscle fatigue can occur anywhere on the body. An initial sign of this condition is muscle weakness, and other symptoms associated with muscle fatigue include soreness, localized pain, shortness of breath, muscle twitching, trembling, a weak grip, muscle cramps.

**Demographics:** There are no specific estimates of percentages of people affected by muscle fatigue, as it can be caused by a variety of factors, such as illness, age, medication and treatment side effects, inactivity, and depression.

### Body Size or Shape

**Definition:** Body size or shape disabilities are disabilities caused by a variety of disorders that affect a person's stature, proportions or shape. Examples include acromegaly, dwarfism, rheumatoid arthritis, and obesity.

**Characteristics:** Characteristics depend on the cause of disability. Orthopedic conditions, such as arthritis and joint mobility, are frequently associated with the underlying cause. Other examples of co-occurring conditions include muscle weakness and fatigue, hearing loss, vision loss, cardiopulmonary disorders, and diabetes.

**Demographics:** Rheumatoid arthritis affects as much as 1% of the worldwide population. It is currently estimated that between 39 - 40 % of adults are obese.

### **Barriers for People with Body Size or Shape Disabilities**

- Seating that is too small, or at the wrong height.
- Appliances and controls that are out of reach or require touch instead of voice commands.
- Steps, thresholds, and other obstacles to gaining entry to a space.
- Body shaming and social discrimination.

### **Resources on Mobility, Flexibility and Body Structure Disabilities**

- WebAIM: [Motor Disabilities](#)
- Case Western Reserve University: [Mobility/Dexterity Impairments](#)
- US National Institutes of Health: [Muscle Fatigue: General Understanding and Treatment](#)
- Healthline.com: [What Causes Muscle Fatigue?](#)
- Scottish National Health Service: [Information about Fatigue Management](#)
- US Centers for Disease Control and Prevention: [Disability and Obesity](#)
- Mayo Clinic: [Acromegaly](#)
- Mayo Clinic: [Dwarfism](#)

## 4.2.6. Cognitive Disabilities

### Overview

Cognitive disabilities may occur on their own or result from a variety of conditions or injuries such as traumatic brain injury. They may also co-occur with other types of disabilities.

### Intellectual Disabilities

**Definition:** Intellectual disability is characterized by significant limitations both in intellectual functioning (reasoning, learning, problem solving) and in adaptive behavior, which covers a range of everyday social and practical skills.

Note that definitions vary depending on the country. What are called intellectual disabilities in some countries are called learning disabilities in others.

According to the American Association of Intellectual and Developmental Disabilities, an individual has intellectual disability if he or she meets three criteria:

- Their IQ is below 70-75.
- There are significant limitations in two or more adaptive areas (skills that are needed to live, work, and play in the community, such as communication or self-care).
- The condition manifests itself before the age of 18.

**Characteristics:** According to the US Centers for Disease Control and Prevention, children with an intellectual disability may:

- Sit up, crawl, or walk later than other children.
- Learn to talk later, or have trouble speaking.
- Find it hard to remember things.
- Have trouble understanding social rules.
- Have trouble seeing the results of their actions.
- Have trouble solving problems.

**Demographics:** It is estimated that between 1 - 3% of the global population, or about 200 million people, have an intellectual disability. The United Nations Development Program estimates that 80 percent of all people with disabilities live in low-income countries.

## Reading and Dyslexia

**Definition:** Dyslexia is a learning disability that impairs a person's ability to read. These individuals typically read at levels significantly lower than expected despite having normal intelligence. Although the disorder varies from person to person, common characteristics among people with dyslexia are difficulty with phonological processing (the manipulation of sounds), spelling, and / or rapid visual-verbal responding. In individuals with adult onset of dyslexia, it usually occurs as a result of brain injury or in the context of dementia; this contrasts with individuals with dyslexia who simply were never identified as children or adolescents. Dyslexia can be inherited in some families, and recent studies have identified a number of genes that may predispose an individual to developing dyslexia.

**Characteristics:** Reading disabilities may include an inability to perceive text or to process the meaning of words, phrases and ideas. The disability may be the result of a congenital difference, injury, delayed development, neurological or physical disability. Some specific reading disabilities have been identified and are recognized by professionals by diagnosis, such as Dyslexia. Often the diagnosis of a learning disability will include components of a reading impairment.

**Demographics:** Dyslexia is thought to be one of the most common language-based learning disabilities. It is the most common cause of reading, writing, and spelling difficulties. Of people with reading difficulties, 70-80% are likely to have some form of dyslexia. It is estimated that between 5-10% of the population has dyslexia, but this number can also be as high as 17% and affects boys and girls in approximately equal proportions.

## Math and Computation

**Definition:** Math and computational disabilities impact a person's ability to learn and communicate math. Dyscalculia involves an inability to understand arithmetic and how to calculate. This disability can be complicated by dysgraphia, an inability to draw or copy figures and graphs, and by anxiety. Dyscalculia may be congenital or result from an injury, disease, or aging.

**Characteristics:** According to Understood's What is Dyscalculia and other sources, common signs of dyscalculia include:

- Trouble grasping the meaning of quantities or concepts like biggest vs smallest
- Understanding that the numeral 5 is the same as the word five, and that these both mean five items.
- Remembering math facts in school, like times tables.
- Counting money or making change.
- Estimating time.
- Judging speed or distance.
- Understanding the logic behind math or holding numbers in their head while solving problems.

**Demographics:** An estimated 3–6% of people have dyscalculia.

## Attention Deficit Hyperactivity Disorder

**Definition:** According to the Cleveland Clinic:

ADHD is a developmental problem characterized by inattention, hyperactivity, and impulsivity. Children with ADHD are easily distracted by sights and sounds in their environment. Symptoms usually appear by age 7. While people do not outgrow this condition, they do learn to adapt.

**Characteristics:** According to the Cleveland Clinic, the main symptoms of ADHD are:

- Inattention
- Distractibility
- Impulsivity
- Hyperactivity

**Demographics:** ADHD affects approximately 11% of the population.



## Autism Spectrum Disorders

**Definition:** According to the World Health Organization:

Autism spectrum disorder (ASD) refers to a range of conditions characterised by some degree of impaired social behaviour, communication and language, and a narrow range of interests and activities that are both unique to the individual and carried out repetitively.

ASDs begin in childhood and tend to persist into adolescence and adulthood. In most cases the conditions are apparent during the first 5 years of life.

Individuals with ASD often present other co-occurring conditions, including epilepsy, depression, anxiety and attention deficit hyperactivity disorder (ADHD). The level of intellectual functioning in individuals with ASDs is extremely variable, extending from profound impairment to superior levels

**Characteristics:** According to the US Center for Disease Control and Prevention, people with ASD may exhibit some of the following traits:

- Not respond to their name by 12 months of age.
- Not point at objects to show interest by 14 months.
- Not play “pretend” games by 18 months.
- Avoid eye contact and want to be alone.
- Have trouble understanding other people’s feelings or talking about their own feelings.
- Have delayed speech and language skills.
- Repeat words or phrases over and over.
- Give unrelated answers to questions.
- Get upset by minor changes.
- Have obsessive interests.
- Flap their hands, rock their body, or spin in circles.
- Have unusual reactions to the way things sound, smell, taste, look, or feel.

**Demographics:** Worldwide, approximately one in 160 children has ASD, though it is reportedly higher in some countries, and its prevalence is increasing.

## Non-verbal Learning Disability

**Definition:** According to the University of Michigan, Michigan Medicine resource, YourChild Development and Behavior Resources, Non-verbal Learning Disability:

Nonverbal Learning Disability is very much like Asperger Syndrome, in which people with the syndrome have normal intelligence and language development, but have trouble with social skills, sensory input, and making transitions. AS and NLD are generally thought to describe the same kind of disorder but to differ in severity, with AS describing more severe symptoms.

**Characteristics:** According to the University of Michigan, Michigan Medicine, some of the signs of NLD include:

- Great vocabulary and verbal expression
- Excellent memory skills
- Attention to detail, but missing the big picture
- Poor abstract reasoning
- Concrete thinking
- Physical awkwardness, poor coordination
- Poor social skills
- Trouble adjusting to changes
- Anxiety, depression, low self-esteem

**Demographics:** Studies estimate that around 1 in 100, or 1 percent, of children in the United States may have NVLD. It tends to affect boys and girls about equally.

## Barriers for People with Cognitive Disabilities

From the W3C's Web Accessibility Initiative and other sources:

- Complex sentences and unusual vocabulary.
- On websites and other technologies, complex page layouts and navigation.
- Long passages of text without images, graphs, or illustrations to help explain concepts.
- Animated, blinking, or flickering images.
- Audio with no option to turn it off.
- Web browsers and media players that do not provide a control to turn off animations or audio.
- Complex visual designs.
- Social isolation discrimination.

## Resources on Cognitive Disabilities

- National Institute for Learning Development Canada: [Learning Disabilities](#)
- Understood: [What is Dyscalculia?](#)
- Understood: [Dysgraphia: What You Need to Know](#)
- [World Health Organization: Neurological Disorders Public Health Challenges](#)
- LearningDisability.co.uk: Learning Disability: [A Very Brief Guide to Learning Disability](#)
- UK National Health Service: [Overview: Learning Disabilities](#)
- National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention: [Facts About Intellectual Disability](#)
- National Institute for Learning Development Canada: [Learning Disabilities](#)
- National Institute of Neurological Disorders and Stroke: [Dyslexia Information Page](#)
- National Institute of Neurological Disorders and Stroke (NINDS): [Dysgraphia Information Page](#)
- National Resource Center on ADHD: [About ADHD](#)
- World Health Organization, Fact Sheet: [Autism Spectrum Disorders](#)
- US Centers for Disease Control and Prevention: [Signs and Symptoms of Autism Spectrum Disorders](#)
- Autism Europe: [Prevalence Rate of Autism](#)
- University of Michigan, Michigan Medicine, YourChild Development and Behavior Resources: [Non-verbal Learning Disability](#)

## 4.2.7. Seizure Disabilities

### Overview

Seizure disabilities occur when a seizure disorder interferes with a person's regular activities. Seizures can range from mild to severe, including loss of consciousness.

### General Seizure Disorders

**Definition:** According to the Mayo Clinic:

A seizure is a sudden, uncontrolled electrical disturbance in the brain. It can cause changes in behavior, movements or feelings, and in levels of consciousness. If a person has two or more seizures or a tendency to have recurrent seizures, they have epilepsy.

**Characteristics:** According to the Merck Manual, depending on the type of seizure, symptoms during a seizure can include:

- Visual hallucinations
- An inability to speak
- Convulsions
- Loss of muscle tone
- Staring
- Falling down
- Biting the tongue
- Loss of control of the bladder or bowels

**Demographics:** About 2% of adults have a seizure at some point in their life. Two thirds of these people never have another one. Seizure disorders commonly begin in early childhood or in late adulthood

### Photosensitive Epilepsy

**Definition:** According to Epilepsy Action:

Photosensitive epilepsy is a condition in which people affected have seizures triggered by flashing or flickering lights, or patterns. There are 2 groups of people who have photosensitive epilepsy: people who only have seizures triggered by flashing or flickering lights, or patterns (sometimes called pure photosensitivity), and people who have seizures triggered by flashing or flickering lights or patterns but also have seizures at other times.

**Characteristics:** According to Epilepsy Action:

- Different people will be affected by lights at different flash or flicker rates. Lights that flash or flicker between 16 and 25 times a second are the most likely to trigger seizures. But some people are sensitive to rates as low as 3 or as high as 60 a second.
- Different people may be affected by different types of pattern. Those patterns with a high contrast or some that move are more likely to trigger seizures. Some video games often contain potentially provocative light stimulation.

**Demographics:** Approximately 3% of people with epilepsy have photosensitive epilepsy.

**Barriers for People with Seizure Disabilities**

From the W3C's Web Accessibility Initiative and other sources:

- Activities in which a sudden loss of consciousness could cause serious harm, such as swimming, taking a bath, or using power tools.
- Driving.
- Moving, blinking, or flickering content in videos, films, websites, and other technologies.
- Web browsers and media players that do not provide controls to stop or turn off video or animations discrimination.

**Resources on Seizure Disabilities**

- Mayo Clinic: Diseases and Conditions: [Seizures](#)
- Merck Sharp & Dohme: [Seizure Disorders](#)
- British Epilepsy Association Epilepsy Action: [Photosensitivity Epilepsy](#)

## 4.2.8. Psychological / Psychiatric Disabilities

### Overview

There are many types of psychological and psychiatric disabilities, which include problems in a person's perceptions, thoughts, feelings, and behavior.

### Social Disabilities

**Definition:** According to the US National Institute of Mental Health:

Social Anxiety Disorder is a disorder in which a person feels anxiety or fear in certain or all social situations, such as meeting new people, dating, being on a job interview, answering a question in class, or having to talk to a cashier in a store. Doing everyday things in front of people, such as eating or drinking in front of others or using a public restroom, also causes anxiety or fear. The person is afraid they will be humiliated, judged, and rejected.

**Characteristics:** According to the US National Institute of Mental Health, when having to perform in front of or be around others, people with social anxiety disorder tend to:

- Blush, sweat, tremble, feel a rapid heart rate, or feel their mind going blank.
- Feel nauseous.
- Show a rigid body posture, make little eye contact, or speak with an overly soft voice.
- Find it scary and difficult to be with other people, especially those they don't already know, and have a hard time talking to them even though they wish they could.
- Be very self-conscious in front of other people and feel embarrassed and awkward.
- Be very afraid that other people will judge them.
- Stay away from places where there are other people.

**Demographics:** The prevalence of anxiety disorders across the world varies from 2.5 - 7% by country. In 2017, an estimated 284 million people experienced an anxiety disorder, making it the most prevalent mental health disorder.

## Emotional Disabilities

**Definition:** According to the Center for Parent Information and Resources:

Emotional disturbance is defined as a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree that adversely affects a child's educational performance:

- An inability to learn that cannot be explained by intellectual, sensory, or health factors.
- An inability to build or maintain satisfactory interpersonal relationships with peers and teachers.
- Inappropriate types of behavior or feelings under normal circumstances.
- A general pervasive mood of unhappiness or depression.
- A tendency to develop physical symptoms or fears associated with personal or school problems.

**Characteristics:** According to the Center for Parent Information and Resources, some of the characteristics and behaviors seen in children who have an emotional disturbance include:

- Hyperactivity
- Aggression or self-injurious behavior
- Withdrawal
- Immaturity
- Learning difficulties

**Demographics:** The World Health Report-2001 showed the worldwide prevalence of emotional disorders was 6.2% among children ages 9-17.



## **Behavioral Disabilities**

**Definition:** According to the US Department of Health and Human Services:

Behavioral disorders involve a pattern of disruptive behaviors in children that last for at least 6 months and cause problems in school, at home and in social situations.

**Characteristics:** According to the same source, someone who has a behavioral disorder may:

- Be inattentive
- Be hyperactive
- Act impulsively
- Act defiantly
- Use drugs
- Commit crimes

**Demographics:** Mental health problems in children are common throughout the world. According to estimates provided by the World Health Organization, 20% or one-fifth of children worldwide suffer with mental and behavioral disorders. Most are adolescents between the ages of 10-19.

World Health Report-2001 showed the prevalence of behavioral disorders was 10.3%, and emotional disorders 6.2% among children ages 9-17. At minimum, 3% of school-age children complain of severe depression, suicidal thoughts, psychosis and attention-deficit hyperactivity disorders.

## **Barriers for People with Psychological / Social Disabilities**

- Limited availability and affordability of mental healthcare services.
- Lack of knowledge among healthcare providers for accurate diagnoses and treatment.
- Social stigma.

### Resources on Psychological / Psychiatric Disabilities

- National Institute of Mental Health: [Social Anxiety Disorder: More Than Just Shyness](#)
- Our World in Data, Mental Health: [Prevalence of Anxiety Disorders](#)
- Center for Parent Information and Resources: [Emotional Disturbance](#)
- Journal of Mental Disorders and Treatment: [Prevalence of Emotional and Behavioral Problems among Adolescence and Some Risk Factors](#)
- Our World in Data: [Mental Health: Prevalence of anxiety disorders](#)
- US Department of Health & Human Services: [Behavioral Disorders](#)

### **4.2.9. Multiple / Compound Disabilities**

Definition: Multiple or compound disabilities describe the phenomenon of more than one disability being present within a person at the same time. They can include physical, mental, or a combination of types. In terms of education, this category is used for students with the most profound disabilities. It does not include deaf-blindness.

Characteristics: According to ProjectIDEAL, children with multiple disabilities typically show deficits in the following developmental areas:

- Intellectual functioning
- Adaptive skills
- Motor skills
- Sensory functioning
- Communication skills

Demographics: Global statistics are not available. The US Department of Education reported that of the 5.9 million students receiving special education services in the 2003-2004 school year, roughly 2% received special education services based on a classification of multiple disabilities.

### Resources on Multiple / Compound Disabilities

- Project IDEAL: [Multiple Disabilities](#)

## 4.3. Assistive Technologies and Adaptive Strategies

### Recommended Study Tasks

- Understand that assistive technologies and adaptive strategies are designed for information communication technology (ICT) or the physical world.
- Know the difference between assistive technologies and adaptive strategies.
- Identify assistive technologies and adaptive strategies for different types of disabilities.

### Overview

Assistive technologies are products used by people with disabilities to help accomplish tasks which they could not accomplish otherwise. When used with computers, assistive technologies are also referred to as adaptive technologies or adaptive software. Some assistive technologies rely on the output of other user agents, such as graphical desktop browsers, text browsers, voice browsers, multimedia players, and plug-ins.

Adaptive strategies are solutions meant to help people with disabilities perform activities of daily living and increase their independence and ability to participate in society.

Adaptive strategies provide enhancements to, or change the methods of, interacting with the environment or technology needed to accomplish a task.

### Resources

- W3C Web Accessibility Initiative, How People Use the Web: [Tools & Techniques](#)
- UNICEF: [Assistive Technology for Children with Disabilities: Creating Opportunities for Education, Inclusion, and Participation](#)
- US National Institutes of Health: [What are Some Types of Assistive Devices & How are They Used?](#)

### Additional Reading

- Action for Blind and Disabled Children: [Input and Output Devices for Physically Disabled People](#)
- Epilepsy Queensland: [Smart Everyday Technologies](#)
- Mouse4All: [Input Devices for Disabled Computer Users](#)

## 4.3.1. Visual Disabilities Assistive Technologies and Adaptive Strategies

### Blindness and Low Vision Challenges and Solutions

Cannot see, or difficult to see, digital or electronic interfaces:

- Screen readers can read interfaces and content out loud by converting text to speech.
- Audio description is an additional audio track that describes and gives context for essential visual information.

Cannot use screen readers on interfaces and digital content not designed with accessibility in mind:

- Interfaces and content must be remediated for accessibility. Interface designers and content authors, if they have access to the necessary files, can edit the markup (which describes the files' presentation or logical structure) to make them compatible with assistive technologies.

Cannot see digital interfaces of public displays, such as digital signs, ATMs and airport kiosks:

- Content should also be announced audibly. On interactive systems, haptic or speech input can facilitate interaction.

Has difficulty seeing low contrast text:

- Software or hardware options can enhance the contrast of digital text by using color combinations with high enough contrast to easily read.

Cannot see when walking:

- Canes help people feel their surroundings as they walk.
- Trained service animals help people navigate.
- GPS-based walking instructions with an audio interface, either automated or via a remote human navigator, help people navigate.
- Use raised tiles on the ground to indicate the edge of a platform, a pathway along a sidewalk, the beginning of a staircase, etc. Eliminate low-hanging architectural features that a blind person could bump into.
- Clear obstructions in hallways and on sidewalks.

Cannot see, or has difficulty seeing, signs or other text on buildings or other locations.

- Map and geolocation applications on mobile devices can announce the names and descriptions of buildings and other location-related information.
- If they are easy to find, braille labels and descriptions on entrances, rooms, bathrooms, historical markers, and other points of interest allow people who know braille explore and understand their surroundings.
- Tactile models of the exterior of buildings, or of floorplans of the interior of buildings help people form a mental map of their surroundings.
- Use color combinations with high contrast.

Cannot see or feel the controls on flat interfaces on devices such as microwaves and dishwashers:

- Use alternative interfaces with knobs or other tactile controls.
- Provide audio interfaces.
- Facilitate remote control through mobile apps.

Cannot read the text on the containers or packaging for consumer items such as medicine, personal care products, and food:

- Embossed braille (or braille stickers) on packaging and product containers help consumers identify items both in the store and after purchase.
- Mobile apps can scan labels of bar/QR codes and read the product information aloud.

Cannot read money to determine its value:

- Mobile apps can photograph the money and read the value aloud.
- Paper bills and coins should be manufactured in different sizes, shapes, or textures to allow people to distinguish the value based on touch or by using a small measuring device.
- Non-cash systems of payment can use voice output or work with screen readers.

Cannot read books, mail, or other printed materials:

- Optical character recognition software can convert scanned images of text into digital text readable by screen readers. Accuracy depends on the capabilities of the conversion software and the quality of the original document, including font choices and line spacing.
- Information can be placed online or in other digital formats to allow people to read the materials using their own assistive technologies.

Cannot tell the color of a clothing item:

- Mobile apps can recognize colors through cameras on mobile devices and speak them aloud.

### Assistive Technologies and Adaptive Strategies

- Screen readers with audio and / or braille output
- Canes
- Service animals
- Navigation aids
- Tactile markers
- Braille signage
- Refreshable braille (note that only a minority of people with blindness know how to read braille)
- Keyboard with large printed letters on keys
- Magnified pointers and cursors
- Speech input
- Voice output
- Large display monitor or projector
- Screen magnification
- Color and contrast controls
- Text spacing control (letter and word spacing, line spacing)
- Vision correction
- Large print

## Colorblindness Challenges and Solutions

Certain color combinations, in particular red and green, can be difficult to distinguish:

- Do not rely on color alone to convey meaning or information.

## Assistive Technologies and Adaptive Strategies

- Color contrast adjusting software
- Standard, consistent positioning and visual presentation of objects
- Screen filters
- Glasses with lens that improve color vision discrimination
- Filtered glasses
- Filtered overlays on printed or electronic text
- Software to modify colors used on a display

## Domain-Specific Resources

- Royal National Institute of Blind People (RNIB): [Assistive technology](#)
- American Foundation for the Blind (AFB):  
[Technology Resources for People with Vision Loss](#)
- University of Illinois Library:  
[Blind/Visual Impairment: Common Assistive Technologies](#)
- American Printing House for the Blind:  
[Assistive Technology for Children Who are Blind or Visually Impaired](#)
- Mobility International USA:  
[Assistive Technology for Blind or Low Vision Participants](#)

## 4.3.2. Auditory Disabilities Assistive Technologies and Adaptive Strategies

### Deafness and Hard of Hearing Challenges and Solutions

Cannot hear talks, presentations, and performances:

- Provide sign language interpretation.
- Provide live captions on a monitor during the speech.

Cannot hear the audio portion of videos:

- Provide synchronized captions with videos.
- Provide sign language interpretation:
- Provide a transcript.

Cannot hear doorbells, alarms, and other alerts:

- Provide alternative visual alerts, such as lights that flash, pulse, dim, or turn on and off.

### Assistive Technologies and Adaptive Strategies

- Video conferencing for signing
- Sign language interpretation
- Teletype
- Captions for videos
- Transcripts for video or audio
- Audio controls
- Assistive listening devices
- Haptic alerts / feedback
- Visual labels / notifications / alerts
- Hearing aids
- Cochlear implants
- Voice carryover
- Frequency Modulation (FM) systems
- Infrared systems
- Audio Induction Loop systems



## Central Auditory Processing Disorder Challenges and Solutions

Has difficulty distinguishing sounds:

- Auditory training such as to identify the location, origin, direction, and distance of a sound.
- Compensatory strategies such as graphical organizers such as story trees, and metacognition strategies such as organization and problem-solving skills.
- Environmental modifications such as acoustic dividers, and eliminating external noise sources such as fluorescent lights that hum or aquariums.

## Assistive Technologies and Adaptive Strategies

- Note-taking apps
- Captions
- Audio controls
- Text-to-speech (TTS) software
- Personal listening devices (PLD)
- Sound field systems
- Noise-canceling headphones
- Audio recorders

## Domain-Specific Resources

- WebAIM: [Auditory Disabilities](#)
- Hearing Australia: [Everything You Need to Know about Hearing](#)
- American Speech-Language-Hearing Association: [Central Auditory Processing Disorder](#)
- Understood: [Assistive Technology for Auditory Processing Disorder](#)

### 4.3.3. Deaf-Blindness

#### Challenges and Solutions

Cannot see digital text.

- A screen reader can convert text to braille on a refreshable braille device, or print it in a braille embosser.

Cannot hear audio, including the audio portion of videos.

- A screen reader can convert a transcript of the audio to braille on a refreshable braille device, or print it in a braille embosser.

Cannot perceive video, including the audio track..

- A screen reader can convert a transcript of the video along with audio descriptions to braille on a refreshable braille device, or print it in a braille embosser.

#### Assistive Technologies and Adaptive Strategies

- Screen reader
- Refreshable braille keyboard
- Printed braille
- Haptic alerts / feedback
- Cane
- Service animals
- Tactile navigation aids
- Tactile sign language interpretation
- Deafblind communicator
- Transcripts for video or audio converted to braille

## Domain-Specific Resources

- Project IDEAL: [Deaf-Blindness](#)
- National Center on Deaf-Blindness Library: [Assistive Technology](#)
- Perkins School for the Blind: [Communication Technology for Persons Who Are Deafblind](#)
- National Federation for the Blind: [Deaf-Blind Communication Technology](#)
- American Foundation for the Blind: [Unique Technologies Presented at First Deaf-Blind International Conference, June 2018](#)

### **4.3.4. Speech Disabilities Assistive Technologies and Adaptive Strategies**

#### Challenges and Solutions

Has difficulty speaking to other persons:

- May use text-to-speech programs or AAC devices.

Often requires repeated exposure to content before long-term memory processing and comprehension takes place:

- Screen readers can read interfaces and content aloud by converting digital text to synthesized speech. Users can adjust rate of speech, vary voice and pitch to get varied exposure to content when they repeat it.
- May be granted additional time to complete tasks.

Cannot use screen readers on digital content and interfaces not designed with accessibility in mind:

- Interface designers and content authors can edit the markup to make it compatible with the assistive technologies used by those with speech and language disabilities.
- May be granted additional time to complete tasks.

Has difficulty writing understandable text:

- May use programs with writing templates, organizational tools, word prediction and spell checkers.
- May use speech-to-text programs.
- May be granted additional time to complete tasks.

## Assistive Technologies and Adaptive Strategies

- Standard non-speech inputs
- Articulation aids
- Augmentative and Alternative Communication (AAC) devices
- Voice carryover
- Text-based alternatives to speech for communication
- Smartphone applications
- Electronic communication boards
- Text-to-speech software
- Keyboards with speech generating functionalities
- Speech apps to allow learners to practice their sounds, sentences, and phrases

## Domain-Specific Resources

- College of San Mateo Library: [Disabilities Awareness and Resources: Common Assistive Technologies. Speech Disorders](#)
- Project IDEAL: [Speech or Language Impairments](#)
- American Speech-Language-Hearing Association (ASHA): [Child Speech and Language](#)

## 4.3.5. Mobility, Flexibility and Body Structure Assistive Technologies and Adaptive Strategies

### Manual Dexterity / Fine Motor Control

#### Assistive Technologies and Adaptive Strategies

- Switch devices
- Adaptive keyboards
- Voice control
- Alternative pointing devices
- Eye tracking
- Voice recognition software
- Speech-to-text software
- Bubble and area cursors
- Customizable keyboard
- Adaptive notepads with word prediction and text-to-speech features
- Mouth stick
- Head wand
- Single-switch access
- Sip and puff switch
- Oversized mouse or trackball
- Adjustable position displays
- Timing controls
- Wheelchair
- Ergonomic / universal design of consumer products

### Ambulation Assistive Technologies and Adaptive Strategies

- Walkers
- Canes
- Crutches
- Manual and electric wheelchairs
- Motorized scooters
- Gait trainers
- Stair lifts
- Lift chairs
- Exoskeletons

### Muscle Fatigue Assistive Technologies and Adaptive Strategies

- Mouth sticks
- Head wands  
Single-switch access
- Auto-type software
- Sip-and-puff switch
- Oversized trackball mouse
- Adaptive keyboard
- Eye-tracking devices
- Voice recognition software

### Body Size Assistive Technologies and Adaptive Strategies

- Pedal extensions for driving
- Stools
- Stepladders
- Grab / rail / handle bars
- Walker
- Cane
- Crutch
- Wheelchair
- Portable toilet / bedside commode
- Bedpan or urinal
- Supplemental oxygen
- Respirator
- Elevator
- Chairlift

### Body Shape or Form Assistive Technologies and Adaptive Strategies

- Canes
- Crutches
- Braces and splints
- Reachers
- Taller chair legs
- Large buttons
- Button hooks
- Velcro closures
- Touch or voice operated light fixtures

### Domain-Specific Resources

- WebAIM: [Motor Disabilities Assistive Technologies](#)
- US National Science Teaching Association:  
[Science for Students with Disabilities: Motor Impaired / Orthopedic Disability](#)

## 4.3.6. Cognitive Disabilities Assistive Technologies and Adaptive Strategies

### Intellectual Disabilities Assistive Technologies and Adaptive Strategies

- Word prediction / lookup
- Simplified interfaces
- Simplified content
- Augmentative and alternative communication (AAC) devices
- Synchronized speech and highlighting
- Visual / audio alternatives to text in signage, messages, instructions
- Direct and immediate help

#### **For Communication:**

- Allowing adequate time to exchange information
- Speaking slowly
- Checking for understanding
- Choosing a quiet location for communicating
- Feedback mechanisms
- Low-tech message boards
- Computerized voice output communication aids
- Synthesized speech



### **For Mobility:**

- Computer-controlled wheelchairs
- Direction-finding applications
- Computer cueing systems and robots to guide users with intellectual disabilities

### **For Environmental Control:**

- Electrical appliance control systems
- Home entertainment systems
- Door locking & unlocking systems

### **For Activities of Daily Living:**

- Automated and computerized dining devices
- Audio prompting devices to assist with memory
- Video-based instructional materials to learn functional life skills

### **For Education:**

- Computer-assisted instruction for word recognition, math, spelling, and social skills

### **For Employment:**

- Video-assisted training for job training and job skill development
- Computer-based prompting applications to assist with staying on task

## Reading and Dyslexia Challenges and Solutions

Perceives words as floating and not in a line:

- Can use a special font developed for dyslexia which weights the letters down and makes similar figures appear differently.
- May be granted additional time to complete tasks.

Perceives words differently than others, such as seeing p b d q as the same letter:

- Can change the font, contrast or add an underline to text to keep words in line.
- May be granted additional time to complete tasks.

Requires additional time to read and process content:

- Can extend time-outs and return to the same location on the page.
- Can use voice output technology to reinforce reading content with the audible version. Can use screen readers which highlight the word or phrase being read to assist with tracking.
- Can use enhanced visible focus indicators to keep track of their position on the page.
- Can use special programs or dictionaries which present words with pictures.
- May be granted additional time to complete tasks.

Has the burden of deciphering content from the way it is presented:

- May apply a custom style sheet.

May have difficulty solving problems presented through security features such as CAPTCHA:

- Support the ability to change the type of problem presented.

May have difficulty processing content through visual means:

- Can use voice output technology to reinforce reading content with the audible version. May be granted additional time to complete tasks.

Difficulties with spelling:

- Spelling and grammar checker.
- Dictation.

### Assistive Technologies and Adaptive Strategies

- Pens for recording lectures, note taking and improving handwriting.
- Pens that can scan and store text and transfer it to a word processor.
- Pens with scanning capabilities for reading comprehension.
- Digital highlighters that instantly transfer words on paper to a digital device for easy note-taking and deeper comprehension.
- Personal tutors for students to practice their learning and increase fluency by building new words, recalling learned words, discriminating between words and reading controlled texts.
- Software that includes text to speech, word prediction, and spell check.
- Online grammar checkers.
- Software that includes color highlighters, notetaking, and bookmarking functions.

### Math and Computation Challenges and Solutions

Inability to distinguish right from left in graphic images:

- Can read data in a data table or text description as an alternative to graphic representations of data.
- May be granted additional time to complete tasks.

Inability to perform calculations:

- Can use an online reference sheet with common equations.
- Can use an onscreen calculator.
- May be granted additional time to complete tasks.

### Assistive Technologies and Adaptive Strategies

- Graph paper to assist with lining up numbers
- Manipulatives (hands-on and virtual)
- Process aids
- Large-key calculators
- Talking calculators
- Math notation tools
- Graphing tools
- Drawing tools
- Equation-solving tools
- Graphic organizers
- Text-to-speech applications
- Dictation tools

### Attention Deficit Disorder Assistive Technologies and Adaptive Strategies

- Electronic math worksheet software
- Calculators with built-in speech synthesizers
- Audio books and reading software
- Optical character recognition (OCR) software
- Speech synthesizers / screen reader systems
- Portable word processors
- Speech-recognition software
- Word-prediction software

### Autism Spectrum Disorder Assistive Technologies and Adaptive Strategies

- Dry erase boards
- Clipboards
- 3-ring binders
- Folders
- Photo albums
- Laminated pictorial representations and photographs
- Highlight tape
- Projectors
- Timers
- Calculators
- Voice output devices
- Video cameras
- Computers
- Adaptive hardware

### Non-Verbal Learning Disabilities Assistive Technologies and Adaptive Strategies

- PECS – Picture Exchange Communication System (pictorial representations of objects and actions)
- VOCAs-Voice Output Communication Aids (Pre-recorded messages that play the name of the object or action)
- Type-to-Talk devices (Similar to VOCAs, Appropriate for those who are able to type on a keyboard; as a person types a word, the device speaks it out)
- Adaptive computers and keyboards

### Domain-Specific Resources

- Braddock, Rizzolo, Thompson, and Bell:  
[Emerging Technologies and Cognitive Disabilities](#)

## 4.3.7. Seizure Disabilities Assistive Technologies and Adaptive Strategies

### General Seizure Disorders Assistive Technologies and Adaptive Strategies

- Mobile digital diary apps with reminders
- Smart watches that detect seizures and send alerts or provide GPS location
- Service animals
- Wearables with an alert button to call for help
- Supportive gear and protective wear in case of a fall

### Photosensitivity Epilepsy Assistive Technologies and Adaptive Strategies

- Flicker-free monitors
- Monitor glare guards
- Non-glare glasses

### Domain-Specific Resources

- Epilepsy Action Australia: [Epilepsy Products](#)
- Epilepsy Foundation: [Devices and Equipment](#)

## 4.3.8. Psychological / Psychiatric Disabilities Assistive Technologies and Adaptive Strategies

### Social Disabilities

- Apps with mood, stress, and anxiety management functions
- Guided meditation

### Emotional Disabilities

- Text-to-speech software
- Reminder devices
- Voice recognition software
- Noise monitoring devices

### **Behavioral Disabilities**

- Behavior chart
- Point sheets
- Goal tracking
- Noise monitoring devices
- Music
- Positive reinforcement
- Rewards such as video and arcade games

### **Domain-Specific Resources**

- Georgia Tech, AMAC: Every Moment Counts: [Using Assistive Technology to Promote Positive Changes with Mental Health Challenges in the Classroom](#)
- University of Illinois Library: [Anxiety Disorders: Common Assistive Technologies](#)

## **4.3.9. Multiple / Compound Disabilities Assistive Technologies and Adaptive Strategies**

- Programmable keyboards
- Writing-support tools
- Communication aids
- Text-to-braille translation software
- Other types of adaptive equipment

### **Resources on Assistive Technologies and Adaptive Strategies for Multiple or Compound Disabilities**

- Paths to Literacy: [Technology for Students with Multiple Disabilities](#)
- Healthcare for Adults with Intellectual and Developmental Disabilities Toolkit for Primary Care Providers: [Communicating Effectively](#)

## 4.4. Disability Demographics and Statistics

### Recommended Study Tasks

Familiarize yourself with the demographics and statistics of populations living with disabilities in various regions around the world.

### Overview

Statistical data on disability is collected and categorized in different ways, so it is important to understand each study within its context.

According to the Rehabilitation Research and Training Center on Disability Statistics and Demographics, Institute on Disability/UCED, University of New Hampshire, 2017 Disability Statistics Annual Report:

Disability statistics generally highlight country and trend data in an attempt at addressing questions such as:

- How many people with disabilities live in a given country, region or in the world?
- What are the percentages of people with different types of disabilities in different age groups?
- How many people with disabilities are employed?
- How much disposable income do people with disabilities have?
- How many people with disabilities are below in poverty?
- How many people with disability smoke, are obesity, have diabetes or have a heart disease?

From Eurostat's report, Disability Statistics Introduced:

Data regarding the functional status of people needs should be taken as a key input for public policy areas such as health, social protection, housing, transport, culture, education and employment. Policy development in these areas can benefit from reliable data on the functional status of the population.



## Resources

- Eurostat: [Disability Statistics Introduced](#)
- Statistics Canada: [Canadian Survey on Disability, 2012](#)
- Rehabilitation Research and Training Center on Disability Statistics and Demographics, Institute on Disability / UCED, University of New Hampshire: [2017 Disability Statistics Annual Report](#)
- Cornell University: [Disability Statistics](#)
- US Centers for Disease Control and Prevention: [Disability Impacts All of Us](#)

## Additional Reading

- Disabled World: [Disability Statistics](#)

## 4.5. Disability Etiquette

### Recommended Study Tasks

Describe and follow disability etiquette guidelines for interacting with people with disabilities.

Judge the appropriateness of various ways of referring to or about people with disabilities.

### Overview

Disability etiquette is a set of guidelines on how to approach a person with disabilities and treat them with respect. For example:

- You should speak to the person directly, not to the person accompanying them.
- Do not make assumptions about what the person can or cannot do.
- Since the impact of a specific disability can vary widely from person to person, you should offer assistance only if the person requests it or after you have asked their permission.
- Acknowledge the individual's ability to make decisions and judgments on their own behalf.
- Use language and terminology that places people first.
- Avoid referring to people by their disability.

### Resources

- United Cerebral Palsy: [Disability Etiquette](#)
- University of Cambridge: [Etiquette](#)
- Independence Australia: [A-Z of Disability Etiquette](#)
- UC Berkeley School of Public Health: [Disability Etiquette Handbook](#)

### Additional Reading

- Parenting Special Needs: [Disability Etiquette 101](#)
- United Spinal Association: [Disability Etiquette. Tips on Interacting with People with Disabilities](#)

## 5. Accessibility and Universal Design

### 5.1. Individual Accommodations versus Universal Design

#### Recommended Study Tasks

- Name the seven principles of universal design.
- Describe the goals and benefits of universal design.
- Understand the relationship between accessibility, usability, and universal design.
- Know the difference between universal design and accommodations.

#### Overview

According to Ireland's National Disability Authority's Centre for Excellence in Universal Design:

Universal design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. An environment (or any building, product, or service in that environment) should be designed to meet the needs of all people who wish to use it. This is not a special requirement, for the benefit of only a minority of the population. It is a fundamental condition of good design. If an environment is accessible, usable, convenient and a pleasure to use, everyone benefits. By considering the diverse needs and abilities of all throughout the design process, universal design creates products, services and environments that meet peoples' needs. Simply put, universal design is good design.

## Resources

- Ireland, National Disability Authority, Centre for Excellence in Universal Design: [What is Universal Design?](#)
- University of Washington: Universal Design: [Process, Principles, and Applications](#)
- University of Cambridge Inclusive Toolkit: [What is Inclusive Design?](#)
- University of Buffalo Center for Inclusive Design: [What is Universal Design?](#)
- OCAD University Inclusive Design Research Center: [What is Inclusive Design?](#)
- US Department of Labor: [Accommodations](#)
- University of Washington, DO-IT: [An Accommodation Model](#)
- University of Washington, DO-IT: [Universal Design vs. Accommodation](#)
- University of Washington, DO-IT: [What is the Difference Between Accessible, Usable, and Universal Design?](#)

## Additional Reading

- Canadian Hearing Society: [Determining your Accommodation Needs](#)
- Colorado State University: [Inclusive Design Approach](#)
- University of Buffalo: [The Goals and Benefits of Universal Design](#)

## 5.2. Benefits of Accessibility

### Recommended Study Tasks

- Describe how accessibility benefits people with different types of disabilities.
- Describe how organizations and society benefit from including people with disabilities.

## Overview

Accessibility benefits individuals by providing them the means to participate in society, in major life activities such as education and employment and social activities that are necessary for health and happiness. Further, families and society benefit from the increased independence of more people, contributions of people with a variety of abilities and disabilities, as well as cost savings and improvements to the built and digital world that improve access and usability for everyone. Schools, employers, groups and organizations of all types also benefit from the increase in innovation and improvements to problem solving that diversity through inclusion brings.

## Resources on Benefits of Accessibility

- Council of Canadians with Disabilities: [Building an Inclusive and Accessible Canada: Supporting People with Disabilities](#)
- Global Public Inclusive Infrastructure: [Benefits to Society](#)
- World Wide Web Consortium: [Accessibility is Important for Individuals, Businesses, Society](#)
- World Wide Web Consortium: [The Business Case for Digital Accessibility](#)
- Australian Government Department of Social Services: [SHUT OUT: The Experience of People with Disabilities and their Families in Australia](#)
- Disability Rights Education and Defense Fund: [Achieving Accessibility: How the Americans with Disabilities Act is Changing the Face and Mind of a Nation](#)
- Improving Seamless Energy-Efficient Mobility Chains for All: [Benefits of Improving Accessibility](#)

## Additional Reading

- Bureau of Internet Accessibility: [Six Unexpected Benefits of Web Accessibility](#)
- The Guardian, Feb. 14, 2018: [What Would a Truly Disabled-Accessible City Look Like?](#)

## 5.3. Web Accessibility

### Recommended Study Tasks

- Understand the basic concepts of the World Wide Web Consortium's Web Content Accessibility Guidelines 2.1.
- Learn the Guidelines' four principles: perceivable, operable, understandable, and robust.
- Understand the components of web accessibility: web content, user agents, and authoring tools.

### Overview

Web accessibility is the ability of a website or application to be easily navigated and understood by a wide range of people, including those who have disabilities.

It combines web development and file creation standards with universal design practices to create websites and applications that are accessible to a broad spectrum of people.

According to the World Wide Web Consortium (W3C) Web Accessibility Initiative Introduction to Web Accessibility page:

Web accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them. More specifically, people must be able to perceive, understand, navigate, interact with and contribute to the Web.

Web accessibility addresses all disabilities that affect access to the Web, including auditory, cognitive, neurological, physical, speech and visual. Web accessibility also benefits people without disabilities, including:

- People using mobile phones, smart watches, smart TVs, and other devices with small screens, different input modes, etc.
- Older people with changing abilities due to aging.
- People with temporary disabilities such as a broken arm or lost glasses.
- People with situational limitations such as in bright sunlight or in an environment where they cannot listen to audio.
- People using a slow Internet connection, or who have limited or expensive bandwidth.

## Resources

- World Wide Web Consortium: [Introduction to Web Accessibility](#)
- World Wide Web Consortium: [Accessibility Principles](#)

### WCAG 2.1 at a Glance

(Adapted from the W3C Web Accessibility Initiative)

#### **Perceivable:**

- Provide text alternatives for non-text content.
- Provide captions and other alternatives for multimedia.
- Create content that can be presented in different ways, including by assistive technologies, without losing meaning.
- Make it easier for users to see and hear content.

#### **Operable:**

- Make all functionality available from a keyboard.
- Give users enough time to read and use content.
- Do not use content that causes seizures or physical reactions.
- Help users navigate and find content.
- Make it easier to use inputs other than a keyboard.

#### **Understandable:**

- Make text readable and understandable.
- Make content appear and operate in predictable ways.
- Help users avoid and correct mistakes.

#### **Robust:**

- Maximize compatibility with current and future user tools

### Resources on WCAG 2.1

- World Wide Web Consortium: [Web Content Accessibility Guidelines \(WCAG\) Overview](#)
- World Wide Web Consortium: [Web Content Accessibility Guidelines 2.1](#)

## 5.4. Accessibility for the Built Environment

### Recommended Study Tasks

- Demonstrate a basic understanding of physical accessibility principles and guidelines for the built environment.
- Understand the principles of universal design.

### Overview

The goal of inclusive design for the built environment is to create and support buildings, public spaces, and transportation systems that are accessible to all people, including those with disabilities. As the prevalence of disability grows, and as populations age, the need for accessibility increases.

### Resources

- The Council of Europe: [Accessibility: Principles and Guidelines](#)
- UK Construction Industry Council: [Essential Principles Guide for Built Environment Professionals](#)
- Irish Wheelchair Association (IWA): [IWA Best Practice Access Guidelines, Designing Accessible Environments - Access to Independence](#)
- Smart Cities for All: [Smart Cities for All Toolkit](#)

## 5.5. Principles of Universal Design

### Equitable Use

- Provide the same means of use for all users: identical whenever possible; equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and safety should be equally available to all users.
- Make the design appealing to all users.



### Flexibility in Use

- Provide choice in methods of use.
- Accommodate right- or left-handed access.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

### Simple and Intuitive Use

- Eliminate unnecessary complexity.
- Be consistent with user expectations and intuition.
- Accommodate a wide range of literacy and language skills.
- Arrange information consistent with its importance.
- Provide effective prompting and feedback during and after task completion.

### Perceptible Information

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings.
- Maximize legibility of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

### Tolerance for Error

- Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.
- Provide failsafe features.
- Discourage unconscious action in tasks that require vigilance.

### Low Physical Effort

- Allow user to maintain a neutral body position
- Use reasonable operating forces.
- Minimize repetitive actions.
- Minimize sustained physical effort.

### Size and Space for Approach and Use

- Provide a clear line of sight to important elements for any seated or standing user.
- Make reaching to all components comfortable for any seated or standing user.
- Accommodate variations in hand and grip size.
- Provide adequate space for the use of assistive devices or personal assistance.

### Resources on Universal Design

- National Institute of Building Sciences, Whole Building Design Guide: [Beyond Accessibility to Universal Design](#)
- Ireland National Disability Authority, Centre for Excellence in Universal Design: [What is Universal Design](#)
- University of Washington: [Universal Design: Process, Principles, and Applications](#)

## 5.6. Universal Design for Learning

### Recommended Study Tasks

- Understand key concepts of the UDL Guidelines.

### Overview

Universal Design for Learning presents a set of guidelines for designing instruction based on principles of cognitive science, that emphasizes flexibility in the presentation and demonstration of knowledge.

### **According to The Center for Applied Special Technology (CAST):**

The UDL framework guides the design of instructional goals, assessments, methods, and materials that can be customized and adjusted to meet individual needs.

## Resources

- The Center for Applied Special Technology (CAST): [The UDL Guidelines](#)
- Erasmus+ Programme, European Union Universal Design for Learning in Higher Education – License to Learn: [Universal Design for Learning - A Best Practice Guideline](#)

### 5.6.1. Principles of Universal Design for Learning

#### Recommended Study Tasks

- Identify and describe the three UDL guidelines.
- Become familiar with the options instructors should provide for each.

#### Overview

The Universal Design for Learning guidelines provides a framework to improve teaching and learning. It is based on research findings on learner diversity.

(Adapted from CAST: The UDL Guidelines)

#### Provide Multiple Means of Engagement

Affect represents a crucial element to learning, and learners differ markedly in the ways in which they can be engaged or motivated to learn. There are a variety of sources that can influence individual variation in affect including neurology, culture, personal relevance, subjectivity, and background knowledge, along with a variety of other factors. Some learners are highly engaged by spontaneity and novelty while others are disengaged, even frightened, by those aspects, preferring strict routine. Some learners might like to work alone, while others prefer to work with their peers. In reality, there is not one means of engagement that will be optimal for all learners in all contexts; providing multiple options for engagement is essential.

#### **Instructors should provide options for:**

- Recruiting learners' interest
- Learners to sustain their efforts
- Learners to self-regulate

### Provide Multiple Means of Representation

Learners differ in the ways that they perceive and comprehend information that is presented to them. For example, those with sensory disabilities (e.g., blindness or deafness); learning disabilities (e.g., dyslexia); language or cultural differences, and so forth may all require different ways of approaching content. Others may simply grasp information quicker or more efficiently through visual or auditory means rather than printed text. Also learning, and transfer of learning, occurs when multiple representations are used, because they allow students to make connections within, as well as between, concepts. In short, there is not one means of representation that will be optimal for all learners; providing options for representation is essential.

**Instructors should provide options for:**

- Perception through different modalities
- Language and symbols
- Comprehension through the design and presentation of information that builds scaffolds for knowledge

### Provide Multiple Means of Action and Expression

**Learners differ in the ways that they can navigate a learning environment and express what they know.** For example, individuals with significant movement impairments (e.g., cerebral palsy), those who struggle with strategic and organizational abilities (executive function disorders), those who have language barriers, and so forth approach learning tasks very differently. Some may be able to express themselves well in written text but not speech, and vice versa. It should also be recognized that action and expression require a great deal of strategy, practice, and organization, and this is another area in which learners can differ. In reality, **there is not one means of action and expression that will be optimal for all learners**; providing options for action and expression is essential.

**Instructors should provide options for:**

- Interacting with tools and environments that make learning physically accessible
- Learners to express themselves and communicate
- Building learners' executive functions through scaffolding

## 5.6.2. Usability and User Experience (UX)

### Recommended Study Tasks

- Describe the differences between usability and user experience.
- Understand how Usability and User Experience complement each other.

### Overview

As user experience has grown as a discipline and practice, it has come to be understood as more comprehensive than usability. While usability, and accessibility, are necessary to the successful design of any product, the experience of it includes every interaction point a person has with it, including becoming aware of it, acquiring or accessing it, using it for the first and subsequent times, and the level of trust and feeling of satisfaction with it.

The Interaction Design Foundation, in its article *Usability: A Part of the User Experience*, describes the differences between usability and UX:

- Usability refers to the ease of access and / or use of a product or website. It's a sub-discipline of User Experience design. Although user experience design (UX Design) and usability were once used interchangeably, we must now understand that usability provides an important contribution to UX; however, it's not the whole of the experience.
- In usability, designers have to focus on three aspects in particular:
- Users should find it easy and become proficient when using a design interface.
- They should be able to achieve their goal easily through using that design.
- They should be able to learn the interface easily, so that return visits are just as, if not more, easy.

Meanwhile, core areas of the user experience include:

- Usability: a measure of a user's ability to arrive on a site, use it easily, and complete the desired task.
- Useful content: The website should include enough information in an easily digestible format so that users can make informed decisions.
- Desirable/Pleasurable Content: The best user experiences come when the user can form an emotional bond with the product or website.
- Accessibility: There are a set of [accessibility](#) standards sites should conform to in order to be used by people with disabilities.
- Credibility: The trust (levels of security and privacy) that a website engenders in users also plays a part in the user experience.

Usability must be considered alongside these other concerns to create a great user experience. The UX comes as much from graphical design, interactive design, content, etc. as it does from usability alone.

## Resources

- Interaction Design Foundation: [Usability: A part of the User Experience](#)
- Usability Geek: [The Difference \(And Relationship\) Between Usability and User Experience](#)
- Jisc Guide: [Usability and User Experience](#)
- UX Planet: [Usability First — Why Usability Design Matters to UI / UX Designers](#)

## 6. Standards, Laws, and Management Strategies

### 6.1. International Declarations and Conventions on Disability Rights

#### Recommended Study Tasks

- Name the most prominent international declarations and conventions that protect human rights and the rights of people with disabilities.
- Explain the main purpose and protections of the Convention on the Rights of Persons with Disabilities.

#### Overview

Because approximately 15% of the world's population is comprised of people with disabilities, as a group they represent the world's largest minority. However, it only recently that people with disabilities have been protected in international human rights law. People with disabilities are not listed among the groups protected against discrimination in the 1948 Universal Declaration of Human Rights. In 1975, the United Nations passed the Declaration on the Rights of Disabled Persons, but since it was a declaration, and not a convention, it could only provide a framework and recommendations. The United Nations' 2006 Convention on the Rights of Persons with Disabilities was developed in response to concerns that there was no legally binding convention on protecting and recognizing the rights of people with disabilities in the existing human rights declarations and conventions.

#### Resources

- United Nations Office of the High Commissioner on Human Rights: [Universal Declaration of Human Rights](#)
- United Nations Office of the High Commissioner on Human Rights: [Human Rights of Persons with Disabilities](#)
- United Nations Office of the High Commissioner on Human Rights: [Declaration on the Rights of Disabled Persons](#)

- United Nations Department of Economic and Social Affairs: [Convention on the Rights of Persons with Disabilities \(CRPD\)](#)
- The World Intellectual Property Organization (WIPO): [Summary of the Marrakesh Treaty](#)
- The World Blind Union: [The Treaty of Marrakesh Explained](#)
- UN Department of Economic and Social Affairs, Division for Social Policy and Development: [International Norms and Standards Relating to Disability](#)
- Disability Rights Education & Defense Fund (DREDF): [International Disability Rights](#)

### 6.1.1. The Universal Declaration of Human Rights

In its introduction to the Universal Declaration of Human Rights, The United Nation's Office of the High Commissioner for Human Rights states that:

The Universal Declaration of Human Rights (UDHR) is a milestone document in the history of human rights. Drafted by representatives with different legal and cultural backgrounds from all regions of the world, it set out, for the first time, fundamental human rights to be universally protected.

### 6.1.2. Convention on the Rights of Persons with Disabilities (CRPD)

In its introduction to The Convention on the Rights of Persons with Disabilities, The United Nation's Office of the High Commissioner for Human Rights states that:

The Convention follows decades of work by the United Nations to change attitudes and approaches to persons with disabilities. It takes to a new height the movement from viewing persons with disabilities as "objects" of charity, medical treatment and social protection towards viewing persons with disabilities as "subjects" with rights, who are capable of claiming those rights and making decisions for their lives based on their free and informed consent as well as being active members of society.

The Convention is intended as a human rights instrument with an explicit, social development dimension. It adopts a broad categorization of persons with disabilities and reaffirms that all persons with all types of disabilities must enjoy all human rights and fundamental freedoms. It clarifies and qualifies how all categories of rights apply to persons with disabilities and identifies areas where adaptations have to be made for persons with disabilities to effectively exercise their rights and areas where their rights



have been violated, and where protection of rights must be reinforced.

The Convention was negotiated during eight sessions of an Ad Hoc Committee of the General Assembly from 2002 to 2006, making it the fastest negotiated human rights treaty.

### 6.1.3. The Marrakesh Treaty

The purpose of the Marrakesh Treaty to Facilitate Access to Published Works for Persons who are Blind, Visually Impaired, or Otherwise Print Disabled is to ensure that people who have vision or other print disabilities have access to books and other printed materials. In its introduction to the treaty, the World Intellectual Property Organization states that:

The Marrakesh Treaty was adopted on June 27, 2013 in Marrakesh and it forms part of the body of international copyright treaties administered by WIPO. It has a clear humanitarian and social development dimension and its main goal is to create a set of mandatory limitations and exceptions for the benefit of the blind, visually impaired, and otherwise print disabled (VIPs).

## 6.2. Regional Instruments on Human and Disability Rights

### Recommended Study Tasks

- Name prominent regional instruments, such as charters and laws, related to disability and human rights.
- Explain the main purposes of each.

### Overview

Some regional human rights conventions specifically protect the rights of persons with disabilities, or have provisions concerning persons with disabilities.

### Resources

- [European Union: EU Charter of Fundamental Rights](#)
- The Equality and Human Rights Commission website: [What is the Charter of Fundamental Rights of the European Union?](#)
- Council of Europe: [The European Social Charter](#)
- African Commission on Human and Peoples' Rights: [African Charter on Human and Peoples' Rights](#)
- The Organization of American States: [Inter-American Convention on the Elimination of All Forms of Discrimination Against Persons with Disabilities](#)

### Additional Reading

- Johns Hopkins University Press Human Rights Quarterly: [The Diffusion of Disability Rights in Europe](#)
- European Commission European Network of Legal Experts in Gender Equality and Non-Discrimination: [Combating Disability Discrimination and Realising Equality: A Comparison of the UN CRPD and EU Equality and Non-Discrimination Law](#)
- European Disability Forum: [The EU Framework on the Rights of Persons with Disabilities](#)

## 6.2.1. Charter of Fundamental Rights of the European Union

### Europe's Equality and Human Rights Commission describes the Charter:

The Charter of Fundamental Rights of the European Union (the Charter) brings together the fundamental rights of everyone living in the EU. It was introduced to bring consistency and clarity to the rights established at different times and in different ways in individual EU Member States.

The Charter sets out the full range of civil, political, economic and social rights based on:

- The fundamental rights and freedoms recognised by the European Convention on Human Rights
- The constitutional traditions of the EU Member States, for example, longstanding protections of rights which exist in the common law and constitutional law of the UK and other EU Member States
- The Council of Europe's Social Charter
- The Community Charter of Fundamental Social Rights of Workers, and
- Other international conventions to which the EU or its Member States are parties.

The Charter became legally binding on EU Member States when the Treaty of Lisbon entered into force in December 2009. Relevant articles include:

#### **Article 26:** Integration of persons with disabilities

The Union recognises and respects the right of persons with disabilities to benefit from measures designed to ensure their independence, social and occupational integration and participation in the life of the community.

#### **Article 21:** Non-discrimination

Any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited.

## 6.2.2. The African Charter on Human and People's Rights

Although the Charter does not specify disability, Article 2 recognizes the rights of all persons:

### ARTICLE 2:

Every individual shall be entitled to the enjoyment of the rights and freedoms recognised and guaranteed in the present Charter without distinction of any kind such as race, ethnic group, colour, sex, language, religion, political or any other opinion, national and social origin, fortune, birth or any status.

## 6.2.3. The Inter-American Convention on the Elimination of All Forms of Discrimination Against Persons with Disabilities

Articles II and III of the Convention lay out the Convention's objectives and how they will be achieved.

### Article II:

The objectives of this Convention are to prevent and eliminate all forms of discrimination against persons with disabilities and to promote their full integration into society.

### Article III:

To achieve the objectives of this Convention, the states parties undertake:

- To adopt the legislative, social, educational, labor-related, or any other measures needed to eliminate discrimination against persons with disabilities and to promote their full integration into society, including, but not limited to:
- Measures to eliminate discrimination gradually and to promote integration by government authorities and / or private entities in providing or making available goods, services, facilities, programs, and activities such as employment, transportation, communications, housing, recreation, education, sports, law enforcement and administration of justice, and political and administrative activities;
- Measures to ensure that new buildings, vehicles, and facilities constructed or manufactured within their respective territories facilitate transportation, communications, and access by persons with disabilities;

- Measures to eliminate, to the extent possible, architectural, transportation, and communication obstacles to facilitate access and use by persons with disabilities; and
- Measures to ensure that persons responsible for applying this Convention and domestic law in this area are trained to do so.
- To work on a priority basis in the following areas:
- Prevention of all forms of preventable disabilities;
- Early detection and intervention, treatment, rehabilitation, education, job training, and the provision of comprehensive services to ensure the optimal level of independence and quality of life for persons with disabilities; and
- Increasing of public awareness through educational campaigns aimed at eliminating prejudices, stereotypes, and other attitudes that jeopardize the right of persons to live as equals, thus promoting respect for and coexistence with persons with disabilities;

## 6.3. National and Provincial Instruments on Disability Rights

### Recommended Study Tasks

- Identify prominent national and provincial instruments, such as laws and acts, that protect people with disabilities.
- Explain the main purposes of each.

### Overview

Civil rights protections for people with disabilities have spread rapidly across many countries in the last thirty years. In the US, the Americans with Disabilities Act (ADA) was adopted in 1990 as one of several US disability-related laws. In Europe, thirty-three countries adopted at least some form of disability equality protections over a twenty-five-year period.

The shift from the medical to the social model of disability is a main driver of the legal shift from a welfare or social security law model towards anti-discrimination or equality law. Such laws are intended to challenge segregation and exclusion as forms of discrimination against people with disabilities, usually by requiring social institutions (governments, corporations, educational institutions, individuals, etc.) to reduce or eliminate discrimination. The other driver considered pivotal to the integration of disability rights in law in many countries is the United Nations Convention on the Rights of Persons with Disabilities.

Most laws share an equality focus rather than a focus on foster social welfare provisions, and disability discrimination laws are considered a truly new development in disability policy around the world. Laws that treat disability as a discrimination category recognize that persons with disabilities are persons with rights instead of problems.

Some disability civil rights laws include prescriptive guidelines or checklists for measuring accessibility in such areas as architecture and the built environment, employment and the workplace, educational settings, retail venues, hospitality and entertainment.

## Resources

- UK Government Legislation, National Archives: [Equality Act 2010](#)
- UK Government, Government Digital Service: [Equality Act 2010: Guidance](#)
- UK Equality and Human Rights Commission: [Being Disabled in Britain: A Journey Less Equal](#)
- US Government: [Americans with Disabilities Act of 1990](#)
- ADA National Network: [What is the American with Disabilities Act \(ADA\)?](#)
- Ontario, Canada: [Ontarians with Disabilities Act 2001](#)
- United Nations Department of Economic and Social Affairs: [Disability Laws and Acts by Country / Area](#)

### 6.3.1. The Equality Act 2010

The United Kingdom passed the Equality Act 2010 in order to bring together formerly disparate anti-discrimination laws and strengthen them, in order to provide people with improved protections from discrimination in the workplace and society. The Introductory Text reads:

An Act to make provision to require Ministers of the Crown and others when making strategic decisions about the exercise of their functions to have regard to the desirability of reducing socio-economic inequalities; to reform and harmonise equality law and restate the greater part of the enactments relating to discrimination and harassment related to certain personal characteristics; to enable certain employers to be required to publish information about the differences in pay between male and female employees; to prohibit victimisation in certain circumstances; to require the exercise of certain functions to be with regard to the need to eliminate discrimination and other prohibited conduct; to enable duties to be imposed in relation to the exercise of public procurement functions; to increase equality of opportunity; to amend the law relating to rights and responsibilities in family relationships; and for connected purposes.

## **Section 4 of the Act articulates which characteristics of persons are protected:**

### **(4) The protected characteristics**

The following characteristics are protected characteristics—

- age
- disability
- gender reassignment
- marriage and civil partnership
- pregnancy and maternity
- race
- religion or belief
- sex
- sexual orientation

### **6.3.2. The Americans with Disabilities Act of 1990**

The Americans with Disabilities Act (ADA) is a civil rights law that puts in place protections for people with disabilities, similar to those provided to on the basis of race, color, sex, national origin, age, and religion. It guarantees equal opportunities for people with disabilities in public accommodations, employment, transportation, state and local government services, and telecommunications.

The Findings of Chapter 126, Equal Opportunity for Individuals with Disabilities, state:

The Congress finds that:

- (1) physical or mental disabilities in no way diminish a person's right to fully participate in all aspects of society, yet many people with physical or mental disabilities have been precluded from doing so because of discrimination; others who have a record of a disability or are regarded as having a disability also have been subjected to discrimination;
- (2) historically, society has tended to isolate and segregate individuals with disabilities, and, despite some improvements, such forms of discrimination against individuals with disabilities continue to be a serious and pervasive social problem;
- (3) discrimination against individuals with disabilities persists in such critical areas as employment, housing, public accommodations, education, transportation,



communication, recreation, institutionalization, health services, voting, and access to public services;

(4) unlike individuals who have experienced discrimination on the basis of race, color, sex, national origin, religion, or age, individuals who have experienced discrimination on the basis of disability have often had no legal recourse to redress such discrimination;

(5) individuals with disabilities continually encounter various forms of discrimination, including outright intentional exclusion, the discriminatory effects of architectural, transportation, and communication barriers, overprotective rules and policies, failure to make modifications to existing facilities and practices, exclusionary qualification standards and criteria, segregation, and relegation to lesser services, programs, activities, benefits, jobs, or other opportunities;

(6) census data, national polls, and other studies have documented that people with disabilities, as a group, occupy an inferior status in our society, and are severely disadvantaged socially, vocationally, economically, and educationally;

(7) the Nation's proper goals regarding individuals with disabilities are to assure equality of opportunity, full participation, independent living, and economic self-sufficiency for such individuals; and

(8) the continuing existence of unfair and unnecessary discrimination and prejudice denies people with disabilities the opportunity to compete on an equal basis and to pursue those opportunities for which our free society is justifiably famous, and costs the United States billions of dollars in unnecessary expenses resulting from dependency and non-productivity.

### 6.3.3. Ontarians with Disabilities Act of 2001

The Ontarians with Disabilities Act, with ongoing refinements, ensures the rights of people with disabilities to equal opportunities and to be free from discrimination. Its preamble reads:

The people of Ontario support the right of persons of all ages with disabilities to enjoy equal opportunity and to participate fully in the life of the province.

Ontarians with disabilities experience barriers to participating in the mainstream of Ontario society. The number of persons with disabilities is expected to increase as the population ages, since the incidence of disability increases with age.

The Government of Ontario is committed to working with every sector of society to build on what it has already achieved together with those sectors and to move towards a province in which no new barriers are created and existing ones are removed. This responsibility rests with every social and economic sector, every region, every government, every organization, institution and association, and every person in Ontario.

## 6.4. Domain-Specific and Government Procurement Laws and Regulations

Some laws target specific technologies or specific domains of the economy.

### 6.4.1. Examples of Domain-Specific Laws

Domain-specific laws address

- US Federal Communications Commission: [Twenty-First Century Communications and Video Accessibility Act \(CVAA\) of 2010](#)
- US Congress: [Air Carrier Access Amendments Act of 2017](#)
- US Department of Transportation: [Passengers with Disabilities: About the Air Carrier Access Act](#)

### 6.4.2. Examples of Procurement Laws

Procurement laws address disabilities at the point of purchase by ensuring that products and services meet accessibility standards.

Examples of disability-related procurement laws include:

- European Union: [EN 301 549 Accessibility](#) Requirements for Public Procurement of ICT Products and Services in Europe
- US Office of Federal Procurement: [Policy 508 Compliance](#)

## 6.5. Applying Accessibility Standards and Regulations to ICT

### Recommended study tasks

- Name prominent examples of accessibility laws and regulations applied to ICT.
- Identify the main enforcement mechanisms of each.

### Overview

Most countries provide laws protecting the civil rights of disabled persons for homes, parks, businesses, and educational facilities. However, this has not been the case with ICT accessibility in all countries.

In the US, federal, state, and local government websites must meet Section 508 regulations, which are based on the W3C Web Content Accessibility Guidelines (WCAG) 2.1.

The Americans with Disabilities Act (ADA) does not include any legal standards for website accessibility owned by private businesses or non-profit organizations. Nevertheless, business and other organizations can be sued for lack of accessibility. Title III of the ADA prohibits discrimination based on disability in the activities of places of public accommodation, which includes businesses, schools, places of recreation, offices, and medical buildings. E-commerce and organizational websites and public mobile applications fall under Title III.

The ADA is enforced by the US Department of Justice Civil Rights Division, and in the case of educational institutions by the US Department of Education Office for Civil Rights, through consent decrees and settlements.

In Europe, the Web Accessibility Directive and The European Accessibility Act set standards and requirements in the European Union:

The European Union Web Accessibility Directive 2016 / 2102, which took effect in September 2018, establishes the accessibility standards rules that all public sector websites and applications in EU member states must implement, maintain, and enforce or risk fines and legal penalties. The Directive refers to the EN 301 549 standards to make websites and mobile apps more accessible. Requirements for websites and applications include:

- Ensuring websites and applications are accessible
- An accessibility statement
- A method for users to report inaccessibility
- A link to enforcement procedures

The European Accessibility Act, passed by the European Commission in June 2019, covers products and services identified as most important for people with disabilities provides common rules, including a comprehensive set of minimum requirements for all private businesses including manufacturers, representatives, importers and distributors (except microenterprises) to make a range of products and services accessible for persons with disabilities including:

- Computers and operating systems
- ATMs
- Ticketing and check-in machines
- Smartphones
- TV equipment related to digital television services
- Telephony services and related equipment
- Access to audio-visual media services such as television broadcast and related consumer equipment
- Services related to air, bus, rail and waterborne passenger transport
- Banking services
- E-books
- E-commerce

The Act allows for NGOs, the responsible national authority or other bodies to go to court on behalf of an individual under national law. It also allows for the imposition of penalties for non-compliance with accessibility standards. Each member state is responsible for enforcement.

## Resources

- World Wide Web Consortium: [Web Accessibility Laws and Policies](#)
- ADA Best Practices Tool Kit for State and Local Governments: [Chapter 5: Web Accessibility Under Title II of the ADA](#)
- The National Law Review: [ADA Website Litigation Likely to Increase](#)
- European Commission, Digital Single Market: Policy: [Web Accessibility](#)
- European Commission, Employment, Social Affairs & Inclusion: [European Accessibility Act](#)

## Additional Reading

- European Commission Employment, Social Affairs & Inclusion: [Accessibility Standardisation](#)
- SiteImprove: [What is the European Web Accessibility Directive?](#)
- US Department of Justice: [Accessibility of State and Local Government Websites to People with Disabilities](#)

## 6.6. Integrating ICT Accessibility Across the Organization

### Recommended Study Tasks

- Describe recommended steps to follow to adopt an ICT accessibility plan across your organization.
- Understand the utility of accessibility maturity models.
- Describe the importance of management champions.

### Overview

To be successful within an organization, ICT accessibility must be approached strategically and programmatically, and implemented as an integral and ongoing activity. It must be a program, not a project.

This section presents recommendations for designing and implementing organizational strategy for ICT accessibility. It also presents example maturity models, which provide methods for defining, managing, and measuring an organization's performance in meeting ICT accessibility best practices. Several models are available, and it is recommended you work with one that best meets the culture and needs of your organization.

### 6.6.1. Resources

- W3C Web Accessibility Initiative (WAI): [Planning and Managing Web Accessibility](#)
- European Agency for Special Needs and Inclusive Education: [Making your Organisation's Information Accessible for All: Implementing the Guidelines for Accessible Information](#)
- Carnegie Mellon University, Software Engineering Institute: [Key Practices of the Capability Maturity Model Version 1.1](#)
- Business Disability Forum: [Accessible Technology Charter: Accessibility Maturity Model](#)
- W3C Web Accessibility Initiative: [Evaluating Web Accessibility Overview](#)
- Employer Assistance and Resource Network on Disability Inclusion: [Creating an Accessible and Welcoming Workplace](#)

## 6.6.2. W3C Web Accessibility Initiative Recommendations

The World Wide Web Consortium's Web Accessibility Initiative provides detailed recommendations for planning, implementing, and sustaining an organizational ICT accessibility program:

### Initiate

To succeed, a web accessibility effort must be well grounded in organizational culture, process, and practice. To do this, align accessibility with existing organizational approaches; develop and communicate clear, measurable objectives; and engage stakeholders to secure understanding and broad support throughout the organization.

- Learn the basics
- Explore the current environment
- Set objectives
- Develop the business case
- Raise awareness
- Gather support
- Plan

Careful planning is critical to effective implementation of any accessibility effort. It ensures a clear assessment of the required work, distribution of tasks, and continual follow-up on progress.

- Create an accessibility policy
- Assign responsibilities
- Determine budget and resources
- Review environment
- Review websites
- Establish a monitoring framework
- Engage with stakeholders
- Implement

Weave accessibility implementation throughout the process to minimize overhead and improve the overall quality of the final outcome. Prioritize quick wins and communicate progress to increase commitment and develop a sense of accomplishment.

- Build skills and expertise
- Integrate goals into policies
- Assign tasks and support delivery
- Evaluate early and regularly
- Prioritize issues
- Track and communicate progress
- Sustain

Keeping momentum helps with the accessibility maintenance for completed projects and builds on completed work for new projects. Regular reviews of content, organizational processes, and resources will help ensure that accessibility remains a priority and issues are identified. Developing a management reporting process will help ensure that it is clear where activity is required for follow-up work.

- Monitor websites
- Engage with stakeholders
- Track standards and legislation
- Adapt to new technologies
- Incorporate user feedback

### **6.6.3. European Agency for Special Needs & Inclusive Education Guidelines**

The Guidelines are published as a freely available resource, and are designed for organizations that want to ensure the information they produce is accessible. The Guidelines include the following recommendations:

- Include an accessibility statement in the organization's long-term strategy.
- Develop a strategy or plan for implementing accessible information.
- Make someone responsible for implementing the information accessibility plan and provide them with the required resources.



- Plan an incremental implementation – be ambitious and modest at the same time.
- Embed accessibility into your information production and dissemination processes.
- Provide information, education and training on accessibility for all staff.
- When outsourcing information production, make sure accessibility requirements are addressed and undergo a quality check.

The Guidelines include a model for organizational implementation, adapted here:

### **1. Policy**

- Develop a long-term strategy that recognizes all aspects of disability.
- Publish an accessibility statement that includes a commitment to make your services and information accessible.
- Develop a procurement policy that covers accessibility compliance for products and services, including those for information production and dissemination.

### **2. Plan**

- Develop an information accessibility plan that is detailed and ambitious, but realistic and covers small steps.
- Ensure the person or team responsible for the plan has authority and resources.

### **3. Practice**

- Conduct a pilot of the Guidelines.
- Provide awareness training for all staff and how accessibility applies to information.
- Provide training for content specialists on tools to make information accessible.
- Produce style guides and templates.
- Update work processes to embed information accessibility.
- Create information using the style guides and templates.
- Give external providers the Guidelines and requirements for compliance.
- Conduct accessibility testing before releasing any services or publishing any information.

## 6.6.4. The Capability Maturity Model for Software, Adapted

The Capability Maturity Model, developed by Carnegie Mellon University, is an IT process improvement model that was initially designed for software development, but it can be applied to measure an organization's ICT accessibility maturity. Version 1.1, which is freely available, is adapted here to ICT accessibility:

### Maturity Levels

#### 1. Initial

- Capability is ad hoc and unpredictable. The organization typically does not provide a stable environment for developing and maintaining accessible products, service, and information.
- Repeatable

#### 2. Policies are in place for managing projects and procedures for ICT accessibility. Processes can be characterized as:

- Practiced
- Documented
- Enforced
- Trained
- Measured
- Able to improve

#### 3. Defined

- Standard processes for developing and maintaining ICT accessibility across the organization are documented, and these processes are integrated into a coherent whole. Processes are used, and changed as appropriate, to help the and staff perform more effectively.

#### 4. Managed

The organization sets quantitative quality goals for products and processes. Processes include well-defined and consistent measurements.

#### 5. Optimizing

The entire organization is focused on continuous process improvement. The organization identifies weaknesses and strengthens the process proactively, with

the goal of preventing the occurrence of defects. Innovations that exploit best practices are identified and transferred throughout the organization.

### **Key Practices**

Each maturity level is attained through commitment to key practices, which include the following common features and what they typically involve:

- 1. Commitment to perform**

Establishment of organizational policies and senior management sponsorship.

- 2. Ability to perform**

Resources, organizational structures, and training.

- 3. Activities performed**

Establishment of plans and procedures, performing and tracking work, taking corrective action as needed.

- 4. Measurement and analysis**

Examples of measurements for determining the status and effectiveness of the activities performed.

- 5. Verifying implementation**

Reviews and audits by management and quality assurance.

## **6.6.5. Business Disability Forum's Accessibility Maturity Model**

Business Disability Forum's Technology Taskforce developed the Accessibility Maturity Model as a self-assessment tool to help organizations benchmark their progress in all aspects of accessibility.

It is based on the Accessible Technology Charter, which lays out ten commitments to good practices in ICT accessibility. Organizations make a public commitment to accessibility when they sign the Charter. It reads as follows:

## Accessible Technology Charter

We will ensure people living with a disability or who acquire a disability can apply for jobs with us, be employed by us, and do business with us, by implementing an inclusive technology strategy which includes the following commitments to accessibility:

1. We will appoint an Executive Level Technology Champion who will report to the board, raise awareness of the benefits of this agenda and ensure that we achieve continuous improvement in this area.
2. We will ensure that colleagues are aware of how technology can liberate the contribution of everyone, as colleagues and customers.
3. We will routinely consult with disabled colleagues, customers and experts to ensure that we understand the impact of our technology on talent management, colleague productivity and our diverse customer base.
4. We will enable built in accessibility to allow reasonable personalisation of technology by our colleagues and customers.
5. We will embed and promote a workplace adjustment process, that provides usable technology solutions for disabled colleagues, within a reasonable timeframe.
6. We will give our relevant teams the accessibility know-how needed to deliver effective business processes and adjustments for disabled colleagues and customers.
7. We will establish our performance baseline using the Accessibility Maturity Model. We will consistently go beyond minimum compliance to bring greater benefits to our business and share best practices with others.
8. We will promote a development lifecycle for our technology solutions that is based on inclusive design from definition to delivery, to minimise the cost and reputational risk triggered by retrofitting products and systems.
9. We will include accessibility as a key requirement within our procurement process and build relationships with supply partners to develop and deliver accessible products and services.
10. We will continuously improve accessibility within our organisation, document what works and share our learning with the Technology Taskforce

### Accessibility Maturity Model

In addition to the Accessible Technology Charter, the Technology Taskforce developed the Accessibility Maturity Model to track progress against the Charter's ten points. An organization assesses its progress on a scale of 1 – 5:

- Level 1: Informal. No documentation or process in place.
- Level 2: Defined. Documented but not actioned, or completed once.
- Level 3: Repeatable. Process established and actioned consistently.
- Level 4: Managed. Process monitored and improved, business as usual.
- Level 5: Best practice. Innovate, improve, and share.

### **6.6.6. The Importance of Management Champions**

Launching and sustaining an accessibility program requires champions from key areas across the organization. It is necessary to build champions' understanding of accessibility so they can both understand the levels of accessibility within their area of responsibility and lead initiatives needed to improve capabilities.

Champions within the organizations become advocates during the accessibility adoption plan, by building engaging their teams, building awareness and skills, and evangelizing accessibility. Champions will help:

- Build a vision and align implementation strategies
- Sustain ongoing commitment and collaboration
- Support the programmatic integration of accessibility throughout organization process, make clear the distinction between it and discreet accessibility projects.
- Lead the adoption of an accessibility maturity model

## 6.6.7. Evaluating for Accessibility

Testing is critical to the design and development of accessible ICT, and practices must be built in to the organization's approach to accessibility. The W3C recommends evaluating early and throughout the design and development process. It is easier and less costly to find and address accessibility issues early.

The following recommendations are compiled from recommendations by the W3C and other organizations:

- Ensure the product or service is fit for purpose. Design for usability by people with disabilities. Consider a “born accessible” approach to design.
- Create reusable design and code libraries that help developers code for accessibility.
- Use quality assurance tools, methods, and protocols including accessibility evaluation tools. Human evaluation is critical to ensuring the product or service created is accessible.
- Perform formative, summative, and continuous evaluations. Test throughout the project lifecycle and any time new content is added or code is updated.
- Include people with disabilities in evaluations.
- If there are gaps in your organization's capabilities, use outside expert analysis and consultation until you build up in-house expertise.

## 6.6.8. Recruiting and Hiring

### Recruiting and Including People with Disabilities

- Include your organization's disability inclusion statement in job postings and on the recruitment pages of your website.
- Posting job openings on disability-focused job boards.
- Ensure your organization's recruitment website and all postings are accessible.
- Promote your organization at disability-focused job fairs.
- Ensure your facilities are accessible to applicants and employees, and that you provide reasonable accommodations including assistive technologies.
- Educate all employees, especially managers, on working with employees with disabilities.
- Ensure hiring and supervising managers understand their obligations for accessibility and the organizational benefits that an employee with disabilities brings to the workplace.

### Recruiting People with Digital Accessibility Skills

Carefully defined the specific skills candidates must have. Depending on the position, skill may include:

- Design using CSS, HTML, and JavaScript
- Development using frameworks and libraries
- Accessibility testing using evaluation tools, keyboard testing
- Ability to use and test with screen reader software
- Ability to create, test and remediate digital files such as documents and presentations
- Knowledge of standards such as WCAG 2.1 and PDF / UA

Post positions on industry job sites and with professional networks such as:

- IAAP Career Center
- a11yjobs Digital Accessibility Job Board
- Professional groups
- Professional discussion groups and mailing lists

## 6.6.9. Communication Management Strategies

- Marketing or external, as well as internal communications must be thoughtfully created to ensure that they are accessible and inclusive. Your organization should:
- Publish accessibility standards for communications.
- Provide training to communicators on using people first and plain language.
- Ensure the accessibility of any documents published.
- Ensure the accessibility of websites and all the media types it contains or references.
- Caption and describe videos and other time-based communications.
- Understand and design for how people use assistive technologies.
- Capitalize on the increased understanding, influence, market, and reputational potential that accessible communications provide.



## 6.6.10. Legal & Public Relations Implications

Universal design and born accessible approaches provide many benefits to the organization beyond increasing the attractiveness of a product or service to a wide audience. Organizations have legal obligations to ensure their products and services, and information about them, are accessible to people with disabilities. In a large organization, its legal or risk and compliance areas should address the legal implications of accessibility. PR should consult with legal or risk and compliance before publishing accessibility information about the organization. In small organizations, people in roles of responsibility should seek guidance from laws and policies on the legal and PR implications.

Recommendations:

- Identify and become familiar with the relevant international, regional, national, and local laws and standards.
- Assess your organization's legal liability.
- Ensure the organization has created and is following an ICT accessibility plan.
- Ensure the ICT accessibility plan includes documenting how products and services meet accessibility standards.
- Capitalize on the positive public relations that accessibility brings your organization.

## 6.6.11. Procurement Processes

- Best practices for procuring accessible products and services include:
- Verifying product accessibility claims.
- Verifying a vendor's accessibility expertise and capacity.
- Requiring product accessibility in contractual agreements.
- Periodically reviewing a vendor's product accessibility roadmap for adherence.
- Leveraging the organization's procurement policies and requirements to influence vendors.







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