# ADVANCED LEVEL: Assistive Technology

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# 1. ADVANCED LEVEL: Assistive Technology (AT)

**Trainer tip:** Before starting this module, the trainer can ask each student to introduce and provide a description of themselves. The trainer should begin the presentations, to set the example for the rest of the group. E.g., "My name is Ursula von der Leyen, I have blonde hair and I am wearing a trouser suit in my office in Brussels, Belgium".

The learning objectives for this module include:

- To gain an overview of the different types of assistive technologies (AT) available and how they are used.

- To provide an insight into the built-in support that exists for accessibility.

- To increase knowledge on where to obtain assistive technology and the different systems that operate in Europe.

- To gain awareness regarding the affordability of AT and the ability to select the appropriate technology according to the user needs.

- To identify AT for the different target groups.

## 1.1 Basic info on types and usage

Assistive technology (AT) is used to increase, maintain, or improve functional capabilities of individuals with disabilities and remove barriers for equally enjoying human rights. It can be anything that helps a person with a disability perform a task and increase participation; hardware or software, acquired commercially off the shelf, modified, or customised.

Assistive technology removes barriers and promotes greater independence by enabling persons with disabilities to perform tasks that they otherwise would have trouble performing. There are many different kinds of assistive technology for different user needs, but essentially the tools provide either input (for example speech control for persons who can't use keyboard or mouse) or

output (for example an electronic voice that reads the content out loud for dyslectic users). There are both licensed software and open-source alternatives. In Smartphones, and to a lesser extent also modern browsers, some of the features of assistive technology are built into the platform.

**Trainer tip:** The trainer can start by asking the group to list the different types of assistive technology that they know in a group discussion. The participants can also provide information on which user groups they think that the different types of assistive technology can be used by.



**Trainer tip:** For each of the different types of assistive technology, the trainer may wish to show a practical example or video showing the technology in use. This would help enhance the learning experience for the participants. The trainer should also check to ensure that the group has a basic understanding of each group of disabilities and difficulties. E.g., ensure they all understand what "cognitive impairments" means. It would be useful to highlight that a person may have a combination of different types of disabilities, people don't just fall into one category.

### 1.1.1 Blind users

Blind users need screen reader and keyboard to navigate the web and read content. A screen reader is a client-based software programme that conveys

navigation as well as content through voice or Braille. Many blind users use voice for navigation and Braille for reading the content. Blind users use the ordinary keyboard, but not the mouse, as the mouse pointer is only detectable visually.

Braille is a system of raised dots representing letters, numbers, punctuation, and words. Not all blind persons read Braille, but in Sweden, Denmark, Spain and the UK, most young people learn it.

[Watch a video featuring assistive technology in use: Visual impairment](#)

[Watch a video featuring assistive technology in use: Visual impairment (with international sign language)](#)

### 1.1.2 Low vision users

For low vision users, there are many different kinds of assistive technology, depending on the specific user needs.

Many low vision users use a screen magnifier, which is a client-based software that allows users to enlarge the texts and graphics on their computer screens for easier viewing. You could compare it to a magnifying glass.

Some low vision users prefer to have the content read out loud to them, and therefore use different kinds of screen readers. These screen readers can be the same as blind users use, but they can also differ, as the low vision user can use it together with the mouse and point to relevant content.

Other low vision users prefer to change the design of the interface to individual settings, for example by choosing another set of colours or fonts or by resizing the text. Some of these functions are also provided by website-based services such as BrowseAloud, which is free to use for visitors of specific websites who subscribe to the service.

Low vision users may also need a large-print keyboard, with large letters printed on the keys, often with contrasting colours.

[Watch a video featuring assistive technology in use: Low vision](#)

[Watch a video featuring assistive technology in use: Low vision (with international sign language)](#)

### 1.1.3 Hard of hearing users

Hard of hearing users can benefit from a variety of devices which enhance auditory information. The Hearing Assistive Technologies (HAT) are designed to overcome distance, background noise, and echo. There are three most commonly used assistive listening devices:

- Frequency Modulation systems (FM systems).

- Infrared systems.

- Audio Induction Loop systems, which allow users to couple their hearing aids to media such as phones, music players, computers, and tablet devices.

HAT can be used by individuals of all ages and in various environments and situations, including home, work, school, social gatherings, hospitals, etc.

### 1.1.4 Deaf users

Deaf users can use different assistive visual technologies, such as visual alerting devices, technologies to convert speech-to-text, and technologies to support telecommunication. The Visual Alerting devices provide typically audible information in visual or vibratory ways. They have built-in lights or vibrators or connect to existing equipment. In order to assist deaf individuals with access to the media, closed and open captioning ("cc") is offered on many media devices and within many media programmes (e.g., YouTube). During conferences and events Real-Time Transcription systems can be used to offer instant translation of the spoken language into text, which can be provided on site or remotely. There are two kinds of real-time translation systems: CART (Communication Access Real-time Translation) which provides word for word transcription, as well as C-Print and Typewell which capture the essence of a

discussion. Captioned telephone can be for telecommunication between individuals.

### 1.1.5 Users with reading and writing impairments

Users with reading and writing impairments often use assistive technology that from a technical point of view may resemble the above-mentioned screen readers and magnifiers, speech synthesis and technologies to convert speech-to-text. But the user interface and handling of the tools can differ quite a lot, since the needs are completely different. For example, for a blind or severely visually impaired user, the screen reader is needed for navigation, when the user uses the keyboard and the screen is not showing anything, the only output is sound. For users with reading and writing impairments, the same technology is used with a mouse to point to the word that the user wants to be read out loud, and the screen is showing not only the text itself, but it also highlights the part of the text that is being read out loud. A variety of different software which helps with spell-checks and synonym suggestions as well as presents text in fonts and colours preferable by the user is also in use.

[Watch a video featuring assistive technology in use: reading and writing impairments](#)

[Watch a video featuring assistive technology in use: reading and writing impairments (with international sign language)](#)

### 1.1.6 Users with cognitive impairments

There are many different tools for users that need cognitive support that can play a huge role in supporting their communication needs and help them to have more autonomy over their lives. Tools that can help to remember things, planning time, reading or finding surroundings are typical for persons who need cognitive support. Another kind of assistive technology that is often suitable for this target group is providing simplification, picture dictionaries, images, illustrations, symbolisation, read out text and explanations. The use of plain language is also very important to support comprehension.

### 1.1.7 Users with motor impairments

For users with motor impairments, there is a variety of input devices, ranging from adaptive keyboards and oversized trackball mouse, to steering the computer with the voice, the eyes, the breath or almost any other part of the body. Most assistive technology supporting users with motor impairments use a virtual keyboard that can be adapted and set up with personal preferences like often used commands, word prediction etc. to make it work efficiently in combination with the chosen input device.

There are low tech solutions like a mouth stick or head wand that allows the user to manipulate a trackball mouse or type in a keyboard or a touch screen. Slightly more sophisticated is the sip-and-puff system, which behaves like a joystick and can interpret the breath of the user together with a virtual keyboard. Another example is the use of a switch through which the user can make a choice through scanning and selecting. Voice recognition can be highly useful for this target group. Eye tracking devices have also become more popular over the last few years. They allow the user to control the computer with eye movements only.

[Watch a video featuring assistive technology in use: Motor impairment](#)

[Watch a video featuring assistive technology in use: Motor impairment (with international sign language)](#)

## 1.2 Built in support Operating System (OS) accessibility

In a barrier free world, everything would be accessible. It is easy to point to challenges, but one positive change that has occurred during the last 5-10 years, is that accessibility is more of a mainstream feature. This is important for at least three reasons:

- It makes accessibility cheaper, as large volumes tend to lower prices.

- It makes accessibility easier to get, as you can buy it in the ordinary shop.

- It makes accessibility available in commonly and widely used gadgets.

Large commercial players like Facebook, Google and YouTube have an enormous impact as role models on digital accessibility. As many of the large corporations are covered by U.S. legislation, their basic technical accessibility is often quite well catered for.

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Competition also helps: Apple used to be mentioned as being the front runner for mainstream built-in accessibility in their smartphones, but these days Android has developed their own accessibility features. The built-in support for enlargement, contrast, light, sound, sign language etc makes the smartphone one of the big revolutions in digital accessibility, and many of these features are now considered basic design-elements.

The constant and fast development of technology in all kinds of platforms and interfaces can also become a challenge in terms of accessibility. Especially when it comes to users of assistive technology, regular updates can cause barriers. In the age of ICT, persons with disabilities have better prerequisites than ever, since technology can compensate for lacking abilities. At the same time, the dependence on technology risks making these target groups vulnerable, as users risk being excluded from content when accessibility fails.

Although mainstreaming of built-in accessibility is mainly positive, it is important to note that some users still need their specific personalised AT, see previous section.

### 1.2.1 Accessibility in action: Facebook

Helping the visually impaired to see images.

Billions of photos are shared on a daily basis across social media channels such as Facebook, Instagram and WhatsApp. Sharing visual content is a very efficient and important way for people to express themselves online. However, for blind people, consuming visual images is very difficult.

In 2016, Facebook introduced automatic alternative text (alt text), that generates a description of a photo using advancements in object recognition technology. If a person is using a screen reader, this feature provides a list of objects that a photo may contain as they scroll down the multitude of photos on the social networking site. Up until this innovation, visually impaired users would have only heard the name of the person who shared the photo, followed by the term "photo" which is not very helpful at all.

This innovation greatly improved the user experience and provides one step further to helping the visually impaired community to enjoy all of the features that Facebook has to offer. It also lifts a great deal of burden for the content author who no longer has to add the ALT-text manually for each image.

Source: [“Using Artificial Intelligence to help blind people “See” Facebook”, Facebook news](#)

**Trainer tip:** The trainer can ask the group if they have used or are aware of this type of built-in accessibility? The trainer can also provide an example of built-in accessibility using one of the social media channels so that the participants can see a real-life example.

## 1.3 Online and browser-based tools

There are plenty of assistive technology and support tools that can be downloaded for free. In general, these tools have less features than "real" AT, as they are developed to solve problems on the lighter end of the scale and often lack advanced setting possibilities.

For example, you can download tools for:

- Text-to-speech to support reading

- Speech-to-text to support writing

- Screen reader for blind users

- Easily readable fonts to support reading

- Word definitions on click to support understanding

- Synchronised note taking and audio recording to support hearing, focus and understanding

- Convert diagrams, mind maps etc into a text, and vice versa to support understanding

- Spell and grammar checks with suggestions for rephrasing to support writing

- Text input to support users with motor impairments

- Communicate support using images, symbols and video

There are also free online libraries with accessible books.

It can be hard to find the tools that fit exactly to every individual need, but there are some good sources to help:

[Understood for all](#)

[Augsburg University](#)

[Bates College](#)

**Trainer tip:** The trainer can download one or more of these tools before the class and provide a real time example of the tools in use. The trainer may even wish to ask the participants to download one of them and try for themselves. Participants can also share some comments on what they have tried and exchange ideas in asynchronous or synchronous communication.
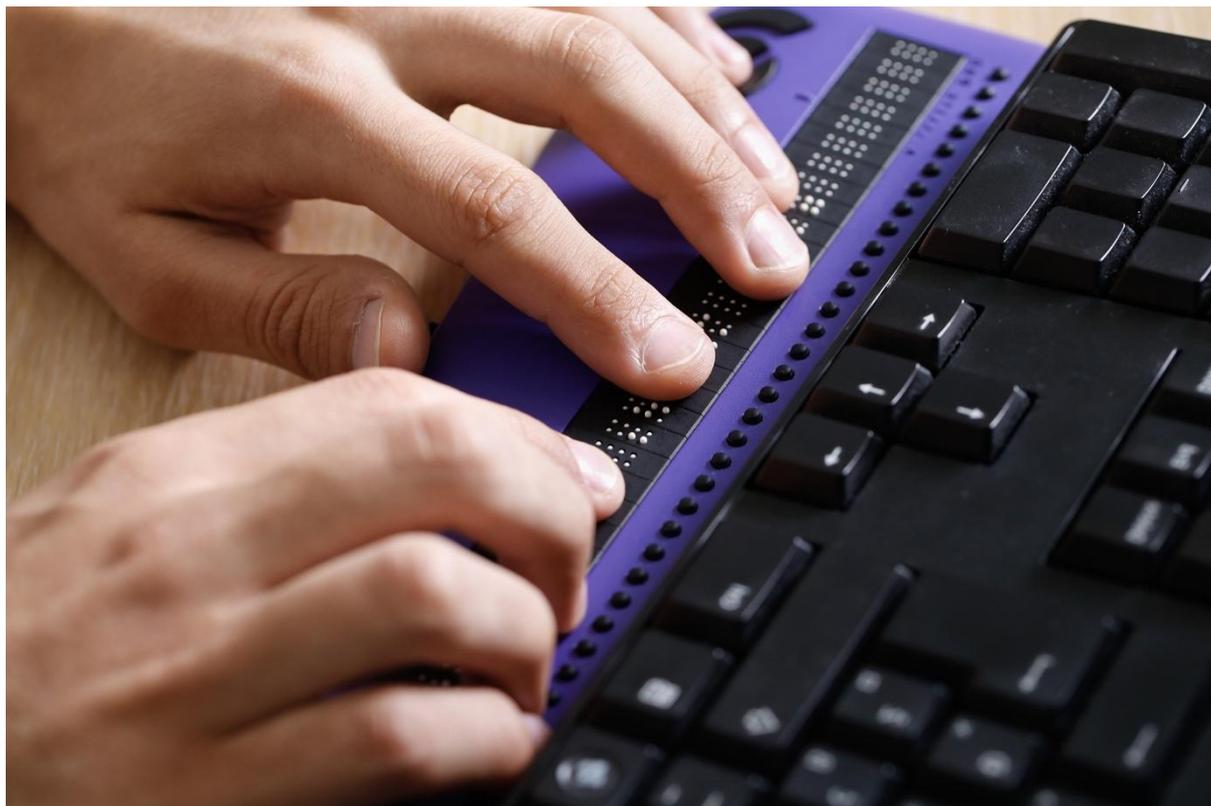
## 1.4 AT support provided by government

The type of assistive technology that is most often referred to when the term is used is client-based software and/or hardware that the user has to apply for, but which in some countries, can be paid for by the government.

This group contains the most advanced tools that are most crucial to the user, such as for example screen readers, hearing aids and eye trackers. This kind of prescribed and individually tried out AT is one of the cornerstones in the web accessibility ecosystem, as they make it possible for persons with severe disabilities to use computers and the web in an independent way. The tools can be customised to the preferred settings of the user, thereby compensating for lacking abilities.

The AT can help the user, but more often it is the tool that makes the difference between being able to use the web or not being able to use the web in an independent way. For example, using a screen reader is the only way a blind person can navigate the web. It is the key that opens the door to a part of

society that is otherwise hidden for the blind user, and therefore a tool for inclusion.

At the same time, the AT can only work properly when the interface is developed and designed in the correct way, following the common standards that both websites and AT producers are to comply with.
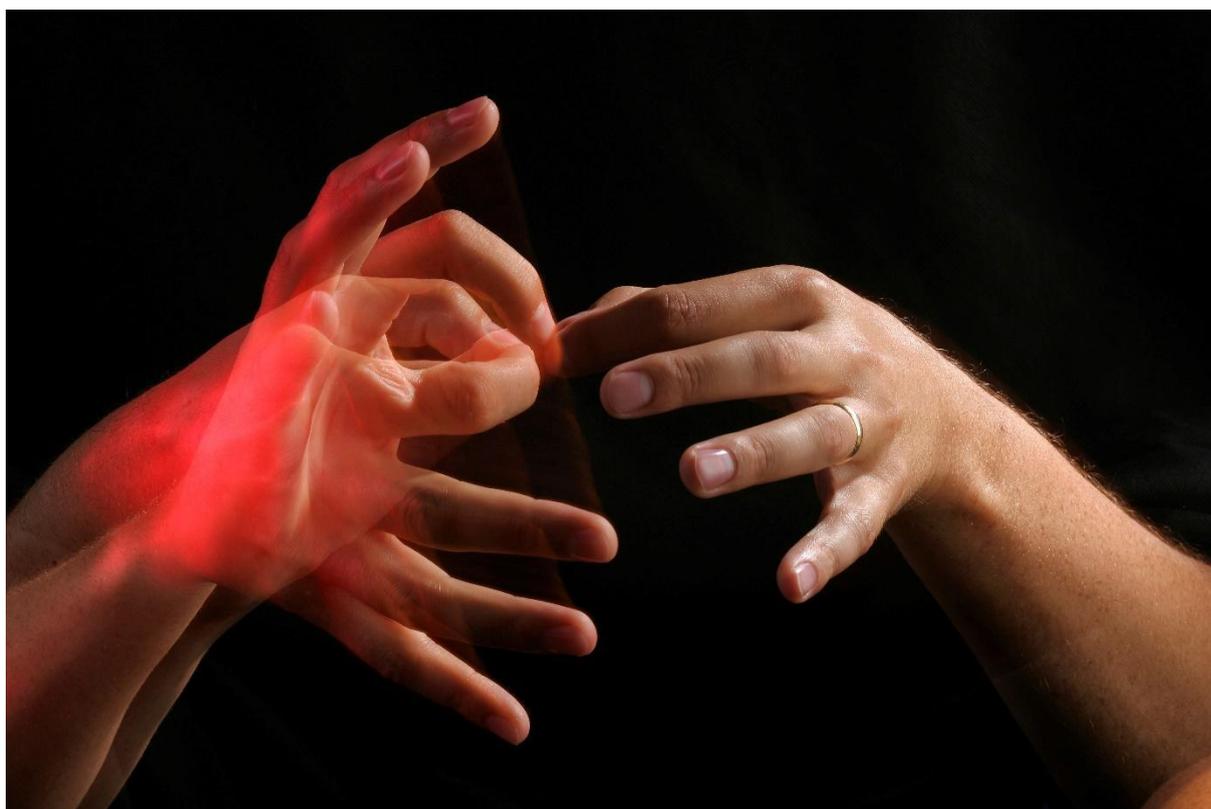


## 1.5 AT User support, training, updates/upgrades and upkeep

For users with assistive technology, it is very important to make sure to use the latest versions of the tools to make sure they work properly. The problem is that there is often a time difference between the release in English and other languages. This leaves the user with two alternatives: either using a new version in a foreign language or staying with the old version which may slowly work less and less efficiently as platforms, Operating Systems (OS) and browsers evolve.

For some user groups, notably visually impaired and medically blind, there is a growing open-source market. Again, the use of these tools is often dependent on the user being able to understand English, and there can be difficulties in

getting support etc. For users who are interested in technology, there are communities to join to learn more. Most Disabled Persons organisations (DPOs) are national, regional or local. At European level, there are a number of umbrella organisations such as the European Disability Forum (EDF), European Blind Union (EBU), European Union of the Deaf, Inclusion Europe and Autism Europe. On an international level, there are also a number of international communities available.

For less tech savvy users, it may be more efficient to stay with the licensed products provided by the government system. Unfortunately, the training and support systems of assistive technology are not always well catered for. Disabled persons organisations may have valuable communities where knowledge is shared:

[European Disability Forum (EDF)](#)

[European Blind Union (EBU)](#)

[European Union of the Deaf](#)

[Inclusion Europe](#)

[Autism Europe](#)

[International communities](#)

**Trainer tip:** The trainer can ask the group if they have experienced any problems with updates and upgrades of technology? How did they go about fixing these problems?

## 1.6 Funding/affordability

In most EU member states, Assistive Technology is provided by the government, but the specific systems and detailed rules differ quite a lot between countries. On the open market AT is often quite expensive.  In some countries, the government procures large quantities of AT centrally, which can make it more efficient for the responsible agency and cheaper for the taxpayers, but it also narrows down the assortment for users. In other countries, the user is granted an

amount of money and can choose and buy the AT him/herself. There are also countries such as the US that some, but limited, insurance plans may cover the cost of AT.

The rules around who is eligible to which AT differ among countries and sometimes even between regions in the same country. It is not uncommon with varying systems covering the user need of AT at home, in education and at work. Many users complain that the system for receiving AT is slow, bureaucratic, complicated and unfair. The process of applying for AT can be difficult to grasp and is often perceived as humiliating.

### 1.7 Understanding what we have learnt: Now it's your turn!

- Think of all of the different types of assistive technologies that you have heard:

    o  Make a list of the assistive technologies.

    o  Identify the user groups that could benefit from using this type of assistive technology.

- Think of any examples of built-in assistive technology that you or someone you know have used in your everyday life on favourite websites, platforms or social media channels:

    o  Make a list of the built-in assistive technologies.

    o  How did they make life easier for you?

**Trainer tip:** These first two questions can be carried out during class or at home. The trainer can ask the participants to share their responses with the rest of the group. For the first question, the trainer can ask different participants to identify different types of assistive technologies until most of them have been identified.

- Access one of the free online resources for assistive technology that are mentioned in this chapter:

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- o   Choose one of the assistive technologies on offer and use it.

**Trainer tip:** If participants have already used one of the free online resources during the class exercise, they should be encouraged to choose another one so that they get used to trying out different types of technology and become aware about the different options available. The trainer can ask the participants to share their experience with the rest of the group.

- Choose one of the user groups highlighted in this chapter

   - o   Identify the type of assistive technology that a person from this group may need to access digital content on the internet

   - o   Is there any built-in content that could help this person?

   - o   Are there free online tools that could help this person?

   - o   If neither of the previous two options are possible, which organisation would this person need to contact in your region/country to enquire further about assistive technology?

**Trainer tip:** The trainer can ask the participants to share their results with the rest of the class and make a list of the built-in or free online tools available. The group can also discuss how to identify the local/regional/national contact points to enquire about government provided assistive technology.